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A System for Fire Safety Evaluation for Multifamily Housing

U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards
National Engineering Laboratory
Center for Fire Research
Washington, DC 20234

September 1982

Interim Report

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A SYSTEM FOR FIRE SAFETY EVALUATION FOR MULTIFAMILY HOUSING

H. E. Nelson and A. J. Shibe

U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards
National Engineering Laboratory
Center for Fire Research
Washington, DC 20234

September 1982

Interim Report

Prepared for:
The Department of Housing and Urban Development
Washington, DC 20410

U.S. DEPARTMENT OF COMMERCE, Malcolm Baldrige, *Secretary*
NATIONAL BUREAU OF STANDARDS, Ernest Ambler, *Director*

PREFACE

This report describes a new Fire Safety Evaluation System for Multifamily Housing, developed specifically to identify alternative combinations of widely accepted fire protection systems and building design features that provide a level of fire safety equivalent to that required by the HUD Minimum Property Standards, March 1980. This work is an extension of research conducted by the Center for Fire Research with support from the Department of Health and Human Services towards development of a Fire Safety Evaluation System for Health Care Facilities.

The Design Concepts Research Group, Center for Fire Research, National Engineering Laboratory, National Bureau of Standards, performed the research described in this report under the sponsorship of the Department of Housing and Urban Development.

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A SYSTEM FOR FIRE SAFETY EVALUATION OF MULTIFAMILY HOUSING

An Interim Report

H. E. Nelson and A. J. Shibe

Abstract

A qualitative evaluation system for grading multifamily housing in terms of fire safety has been developed and is ready for testing in Department of Housing and Urban Development field offices. The system is designed to be used to identify various combinations of widely accepted fire safety equipment and building construction features that provide a level of safety equal to or greater than that achieved by strict conformance to the explicit requirements of the HUD Minimum Property Standards. In this evaluation, equivalent safety performance is gauged in terms of overall level of safety provided rather than by a component by component comparison.

1. INTRODUCTION

Identifying levels of safety in existing buildings and providing cost-effective minimum levels of fire safety in multifamily residences are major concerns of the Department of Housing and Urban Development. Rising construction and operating costs, coupled with more stringent building codes, are forcing the builders of multifamily residences to assess carefully the alternative means by which they may design, construct, or rehabilitate their buildings.

The National Bureau of Standards, Center for Fire Research, with support from the Department of Health and Human Services (HHS), has previously developed a method for determining how combinations of several widely accepted fire safety practices could be used to provide a level of safety equivalent to that required by the Life Safety Code promulgated by the National Fire Protection Association (NFPA). The method is called the Fire Safety Evaluation System for Health Care Facilities. A detailed description can be found in H. E. Nelson and A. J. Shibe, "A System for Fire Safety Evaluation of Health Care Facilities", NBSIR-78-1555-1 [1]*. HHS has adopted that system in their fire safety requirements for institutions receiving funds for the support of Medicaid and Medicare clients. The NFPA has included the system as part of the 1981 Life Safety Code [2]. The system described in this document is an extension of the concepts used in the health care facility system.

The Department of Housing and Urban Development's (HUD) standard criteria for multifamily residences are stipulated in the "Minimum Property Standards for Multifamily Housing" (MPS) [3]. The MPS identify minimum levels of fire safety in new buildings designed or built with financial support from HUD. While the MPS prescribe specific approaches to fire safety in new multifamily buildings, they also allow "equivalent" solutions. But, the MPS neither define alternative approaches nor provide a mechanism for evaluating equivalency among the alternatives. For rehabilitation construction and for existing buildings, the MPS do not provide specific fire safety criteria but give general guidance on how to achieve the desired levels of fire safety.

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* Numbers in brackets refer to literature references listed at the end of this paper.

The remainder of this report describes a new Fire Safety Evaluation System (FSES) for Multifamily Housing developed specifically to determine alternative combinations of widely accepted fire safety systems and arrangements that provide a level of safety equivalent to that required by the 1980 MPS. The system is intended to evaluate designs for proposed new buildings, for renovation of existing buildings, or for existing buildings as they stand.

2. SCOPE

This evaluation system applies to multifamily residences only. The total system covers all aspects of building fire safety currently covered by the MPS. A few of the items related to built-in utility systems and to roofs and balconies have been excluded from the grading portion of the system. An attachment to the basic evaluation system provides separate consideration for these items. In order to demonstrate equivalent fire safety, the building must both satisfy the requirements in this attachment and equal or excel the minimum point scores in the grading portion of the evaluation system.

3. PURPOSE

The purpose of the evaluation system is to provide a rationally based mechanism applicable to multifamily facilities for:

a. Evaluating an existing facility to determine how the actual level of fire safety in that facility compares with the level of fire safety that would be provided by strict conformance to the requirements of the 1980 MPS.

b. Evaluating various alternative approaches available to upgrade an existing facility to a level of fire safety that meets or exceeds the level prescribed by the MPS.

c. Evaluating a proposed new facility design to determine how its level of fire safety would compare to that required for such a facility by the MPS.

4. EQUIVALENCY CONCEPT

The evaluation system provides a method for determining the design features needed to provide equivalence to the 1980 MPS. Equivalency, for the purpose of the system, is judged by comparing the total fire safety level prescribed by the MPS for multifamily facilities to the actual safety level in a particular design or an actual facility.

Equivalency determination is based on the concept that, while the MPS documents do not include a specific statement of the level of safety provided, it is possible by examining the MPS requirements to impute one. This imputed level becomes a base line for comparing the level of safety provided by conformance to MPS requirements with the level of safety provided by alternative systems of safeguards. This comparison is made on the basis of the total safety performance of the building, including all of its safeguards, without making direct comparisons between a specific standard requirement for an element and the corresponding element as it exists in the building.

Evaluation of equivalency of fire safety involves consideration of two separate concepts:

a. General Fire Safety Requirement - the ability of the building and its fire protection systems to provide measures of general safety commensurate with MPS requirements.

b. Safety Redundancy - in-depth (redundant) protection through the simultaneous provision of alternative approaches to safety such as fire control, egress, and refuge. Each approach independently provides at least a minimum level of protection. The design of the complete fire safety system incorporating all the alternatives is intended to ensure that the failure of a single protection device or method will not result in a failure of the entire system. This is further discussed in section 6.4.

5. PROJECT METHODOLOGY

Development of the fire safety evaluation system consisted of three operations: system design, professional judgement review and critique, and system testing.

a. System Design. This consisted of: (1) analysis of the stated requirements of the 1980 MPS in terms of the specific functional contribution to fire safety of each MPS requirement, (2) organization of the results of this analysis into a format suitable for soliciting professional judgements of the

comparative worth of the fundamental requirements relative to the MPS objectives for multifamily facilities, (3) development of a computer program to evaluate alternative designs and fire protection systems, and (4) incorporation of systems changes resulting from the iterative professional judgement review and system tests.

b. Professional Judgement Participation and Review. Professional judgement input was asked and received from two different groups: (1) an NBS group, through the mechanism of a "Delphi" exercise (see Appendix A for description of the NBS Delphi operation), and (2) an outside "Peer" review group (see Appendix B). The Delphi group (an ad hoc group of fire protection experts in the NBS Center for Fire Research) refined the format, established initial values of the safety parameters, and provided judgement values for selecting individual safety parameters in the redundancy evaluations. The outside Peer group consisted of prominent persons in the field of regulation and specification of fire safety requirements in residential facilities. The Peer group provided broad-based technical information and judgemental insight for improving both the format and the final values assigned to the safety parameters and the redundancy factors.

c. System Testing. The testing involved a series of exercises to determine the validity of the fire evaluation system. These exercises included both field tests of <u>actual</u> facilities by NBS

personnel and computer analysis of hypothetical alternative design systems. (The Department of Housing and Urban Development is planning to further test the system using their engineering staff in the HUD regional offices.)

6. SYSTEMS DESCRIPTION

6.1 Capabilities and Limitations

The system that has evolved from this effort provides a means of mixing recognized and proven fire safety systems and approaches during facility design and then evaluating these mixes in terms of the overall fire safety performance of the facility. The system permits comparative evaluations of the fire risks and fire safety factors implicit in individual facilities or designs. Those features (parameters) that are in excess of minimum safety requirements are given appropriate credit, reflecting the degree of additional safety provided. This is in contrast to strict adherence to MPS where no credit is given for meeting higher safety levels than the minimum for a given feature. The credit, however, is limited in its application to those areas of fire safety impact where the safeguards provide credible improvements in safety. Conversely, features that increase one or more aspects of fire risk are appropriately charged for their detrimental impact on safety. The FSES solution is intended to be an assessment of total safety performance as compared to measuring compliance with a minimum safety level. The result provides opportunity for cost reduction, wider choice of design alternatives, and operational flexibility at greater levels than currently available through strict, literal compliance with the MPS requirements.

The Fire Safety Evaluation Worksheet (FSES) is the instrument used to determine equivalency and is illustrated in Figure 1. The worksheet in Figure 1 is supported by a glossary, included as Appendix D in this report.

The most important limitations of the evaluation system are:

a. As presently developed the evaluation system applies only to the 1980 MPS, although it could readily be revised to meet changes in the MPS.

b. The results are expressed in equivalency to the level of safety achieved by the MPS, and should not be construed as a measure of total or absolute fire safety.

c. The system, like all existing methods for regulating or evaluating fire safety, is only partially supported by technical information or statistics. The professional judgement of experts in a series of balanced peer-consensus groups is used to bridge the gaps in reproducible, reliable technical knowledge.

d. In general the evaluation system is limited to evaluating the interrelationships of those fire safety methodologies and approaches that are defined in the MPS. There is no basis in the system for accommodating completely innovative approaches (such as automatic venting at the point of fire or the use of halogenated gases as a general protection system).

e. While the parameter measurements of the system cover built-in structural materials and elements, space arrangement, and fire protection systems and devices, the system does not provide alternate approaches to meeting the MPS requirements for:

(1) Utilities such as heating, air conditioning, electrical, and incinerator systems.

(2) Balcony and Roof Requirements.

(3) Administrative activities such as emergency plans and fire drills.

When using the evaluation system, the additional fire safety requirements in these areas are applied in the traditional manner of explicit conformance with the established standards and requirements as described and/or referenced in the MPS.

6.2 Safety Parameters

The safety parameters are measures of those building and fire protection features that bear upon the safety of residents (and other occupants) who may be in the building at the time of a fire.

The safety parameters were selected by examining the specific element requirements of the 1980 MPS, and by evaluating the contribution of various elements of the standard to safety. The selected safety parameters were modified first by the NBS Delphi panel and later by the Peer group. The selected safety parameters are shown in Figure 2, Safety Parameters.

Each of the safety parameters was analyzed. Where the current standard requirements recognize several levels of a parameter (e.g., the MPS recognizes seven different levels of construction), all have been included in the matrix. In addition, conditions likely to be encountered in situations failing to meet the explicit requirements, and conditions exceeding those required by the code but available for increased protection were also listed. Figure 3 shows the final "matrix" form of the 14 selected safety parameters, each having three to eight subdivisions.

The safety parameters are designed to constitute a complete assembly of those basic building features for which equivalency can be expressed in determining the level of safety in a multifamily facility. An additional series of items required by the MPS but outside the scope of the equivalency covered by the listed safety parameters relate primarily to building utilities, operational procedures and areas per floor (see discussion in section 6.1.e). A companion check list covering these items has been prepared as part of the evaluation system worksheets. This check list is included in Figure 1 as Subfigure 1f.

6.3 Safety Parameter Evaluation

A Delphi type group was established to bring the most informed judgement and experience together to assess the relative impact on general safety of each of the parameters in each of the potential conditions listed.

Each member of the group was provided with copies of an initial matrix similar to the one shown in Figure 3. Each person then evaluated the relative importance with respect to fire safety of each item in the entire matrix of parameters without consultation with other members of the group. The members of the Delphi group were advised that the risk being considered covered new and existing multifamily facilities and that the objective was a system to measure equivalency with the safety level provided by the 1980 MPS. The value judgements made by this group are, therefore, considered to be based on their understanding of the character and needs of residents in multifamily facilities.

6.4 Redundant Safety Subsystems

A basic principle of the MPS is that there will be a redundancy of protection so that the failure of a single protection device or method will not result in failure of the entire safety system. In addition, the development of a redundant approach, as used in this safety evaluation system, avoids the pitfall of traditional approaches sometimes used in grading systems where all of the elements are considered mutually exclusive of each other and a single total score determines acceptability. It is possible under such a system to fail to detect the absence of a critical element. The evaluation

system establishes redundancy on the basis of in-depth coverage of principal fire safety methodologies. The redundant methodologies used in the system are those related to fire safety through fire control, egress, and refuge.

The redundant methodologies were chosen after examination of decision tree approaches [4,5]. These approaches divide fire protection into elements. Those elements related to "Manage Fire" (i.e, the control of fuel and arrangement, compartmentation, and other mechanisms of containment of fire and its impacts, extinguishment suppressions and other means of terminating fire development) are incorporated into Fire Control.

"Manage Exposed" (i.e., the provision of safe location of refuge either by evacuation or by establishment of safe areas of refuge) was subdivided into two redundancy methodologies, egress and refuge.

Each member of the Delphi groups identified the importance of each safety parameter relative to the separate fire safety methodologies of fire control, egress, and refuge. These group results were processed and analyzed by project staff at NBS and then reviewed in subsequent conference meetings of the Delphi group. By this process, the parameters that have a significant impact on each of the redundant methodologies were identified. It was found that many of the parameters affect more than one of the methodologies. In the judgement of the group, sprinklers, separations of living units, vertical openings, and protection of hazardous areas impact on all three. Figure 1c shows the breakdown in terms of which parameters apply to which methodologies.

6.5 Calibrating the System to the Minimum Property Standards

The system as developed can be used to obtain scores for four individual safety factors. These factors are entitled general fire safety, fire control, egress provided, and refuge provided. A minimum score defining equivalency to the MPS for each of the four safety factors is required as the base of reference for determining equivalency by this system. This section describes how these minimum values were set.

The MPS provides explicit requirements for New Multifamily Housing and for New Housing for the Elderly. The MPS, however, provides only general guidance on how to achieve the desired fire safety levels for Rehabilitation Multifamily Housing, Rehabilitation Housing for the Elderly, Existing Multifamily Housing and Existing Housing for the Elderly. HUD officials who were also members of the Peer group, translated the general guidelines into specific requirements matching the parameters in the FSES.

For each set of specific MPS requirements, there is a corresponding set of requirements in Table 1 (Figure 1b) that corresponds to each of the 14 safety parameters. For example, Figure 4a shows the requirements for Multifamily Housing with three or fewer stories and more than 8 units per floor: a circle is placed in each box that corresponds to the requirements. The mininmum values are determined by using Table 2 (Figure 1c). The circled values in Table 1 (see Figure 4a) are transferred to the appropriate unshaded blocks in Table 2 (Figure 1c). Where the block contains a ÷ 2, one half of the value shown in Figure 1b is entered. The four columns are each summed. For example, the requirements in Figure 4a are transferred to Figure 4b and

the minimum score for fire control is 5.5, for egress provided is 8, for refuge provided is 8, and for general fire safety is 7. These minimum safety requirements define the minimum scores for equivalence in multifamily housing with three or fewer stories, and more than 8 units per floor.

Fire safety requirements for each set of requirements with subdivisions for building height and number of living units were determined using this approach. The resulting values are the basis of equivalency for each area of requirement. The final resultant values constitute the Mandatory Safety Requirements shown in Figures 1d-1 and 1d-2. The specific parameter values and the results are shown in Figures 4 through 33. Equivalency for any specific facility requires that the scores for the evaluated facility in each of the four individual safety factors (i.e., General Fire Safety, Fire Control, Egress Provided, and Refuge Provided) equal or exceed score achieved for the set of MPS requirements that apply to that specific type and class of facility.

7. COMPUTER ANALYSIS

The evaluation system is theoretically capable of evaluating each of about 3 billion combinations of the 14 safety parameters and variations (but practical arrangements in existing buildings and future designs are of the order of a few thousand). A computer program, described in Appendix C, was developed for verifying the original proposed system as well as to analyze potential proposed changes. The program can generate all alternative combinations of parameter values (i.e., safety features) that the FSES will indicate as equivalent to the MPS.

By using the computer program, the evaluator can review all acceptable solutions for a given building configuration and can also be assured that answers are not biased by individual preference. The printouts of the building arrangements can be easily analyzed by an experienced individual to establish acceptability of solutions. The computer generated building configurations, based on the FSES guidelines, were used by the NBS staff and the consultant group to compare MPS levels of safety to the FSES proposed levels of safety.

8. FIRE SAFETY EVALUATION WORKSHEET FOR MULTIFAMILY HOUSING

All of the parameters, variables, and formulas for determining the facility safety equivalency with the MPS are contained in a self-instructing form. A separate manual (Appendix D) was prepared to assist in completion of the evaluation form. The manual provides expanded discussions and definitions of various items in the evaluation sheet to assist the surveyor or reviewer when questions of definition, interpretations, or meaning arise.

HUD participants in this project suggested including an additional safety parameter level for Parameter 9, "Separation of Living Units from Each Other and from Common Spaces". This special level covers a configuration defined as wall separations having a two-hour or greater fire resistance with any doors in such walls being class "C" or better (fire doors having a fire resistance rating of 45 minutes). It is intended that the safety parameter value for this additional parameter level is to be awarded only where the building construction is Type 1 or Type 2a. A preliminary computer analysis shows that parameter levels between 6 and 10 produce building configurations allowing a

range of types of alternative systems not otherwise available. The proposed HUD field tests may also produce a number of building configurations which will include this type of superior separation. Based on the results of HUD field tests and with additional computer analysis, NBS will present to the peer group safety values for the superior separation environment for their appraisal. After that group has made their appraisal for the appropriate action on inclusion and safety value, NBS will recommend the necessary changes in Table 1, "Safety Parameter Values".

9. SUMMARY

The conclusions resulting from this study are briefly stated as follows:

a. A method has been developed and described for generating equivalency to a specified set of occupancy safety requirements. This method is based on the articulation of levels of building safety and on the redundancy of safeguards. This method can provide the necessary flexibility enabling a designer to achieve minimum cost solutions for a specified level of safety.

b. The described method "System for Fire Safety Evaluation of Multifamily Housing" is a specific example of an equivalency approach. The system provides equivalency to the minimum life safety requirements for the 1980 MPS and can be revised to reflect later editions of the MPS.

FIRE SAFETY EVALUATION WORKSHEET

FOR MULTIFAMILY RESIDENCES

BUILDING IDENTIFICATION_____

EVALUATOR _____DATE _____

Complete one worksheet for each building evaluated.

STEP 1. Complete the building identification, evaluator and date entries above.

Figure 1a. Fire Safety Evaluation Worksheet

Step 2. Determine Safety Parameter Values - Table 1.

A. Select and circle the parameter value for each safety parameter in Table 1 that best describes the conditions in the building. Choose only one value for each of the 14 safety parameters. If two or more appear to apply, choose the one with the lowest point value.

Table 1. SAFETY PARAMETER VALUES

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B HT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	−2	0	−2	0	−1	−2	2	2
4-6 STORY	−8	−2	−8	0	−3	−5	2	2
OVER 6 STORY	−10	−4	−10	−2	−4	−8	0	2

2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE		OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	
	−7	−4	−4[−7]A	0	0

3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM	
		w/o F.D. NOTIFICATION	w/ F.D. NOTIFICATION
	−1	2	3

4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM		
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING
				EVERY LEVEL	EVERY BEDROOM	
	−4	0	2	3	4	6

5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.	LIVING UNITS ONLY	CORRIDORS, HAB., & PUBLIC SPACES	TOTAL BUILDING
	0	2[0]B	4[0]B	6	0

6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	−1	0

7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN.
	−2	0	1

8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS
	>50' TRAV	≤ 50'	>50' TRAV.	≤ 50' TRAV.	
	−2	−1	−1	0	1

9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN.		WALLS ≥20 MIN. < 1 HR. DOORS ≥20 MIN.	WALLS ≥1 HR. DOORS ≥20 MIN. w/ AC	WALLS ≥2 HR. DOORS ≥45 MIN. w/ AC
		DOORS < 20 MIN	DOORS ≥20 MIN.			
	−6	−2	0[−2]A	2[−2]A	4[−2]A	C

10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES			
		DEFICIENT	w/o HORIZ	HORIZ. EXIT	DIRECT EXIT
	−6[0]E	−2[0]E	0	2	4

11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:			
	> 100'	50-100'	35-50'	>150'	100-150'	50-100'	< 50'
	−6[0]D	−2	−1	−2	−1	0	2

12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	−1	0

13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED	
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥ 1 HR.
	−10	−7	−2	0	2[0]A

14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC	
					BY ZONE	BY UNIT/CORR.
	0	2	2	3	3	4

NOTES:
A - Use [ ] if Safety Parameter 1 is based on 2-U, 3-U, or 4-U construction and Safety Parameter 5 does not have a value of 6 or 8.
B - Use [0] if Safety Parameter 1 is based on 2-U, 3-U, or 4-U construction.
C - This parameter value to be set at a later date [7/31/81]
D - Use [0] if Safety Parameter 10 is −6.
E - Use [0] where single exit is acceptable [see 405-6.3].

Figure 1b. Fire Safety Evaluation Worksheet

STEP 3. COMPUTE INDIVIDUAL SAFETY EVALUATIONS - USE TABLE 2

1. Transfer each of the 14 circled safety parameter values on Table 1 to every unshaded block in the line with the corresponding safety parameter in Table 2. Where the block is indicated (÷2) enter only one-half the value shown in Table 1.

2. Add the four columns, keeping in mind that any negative numbers deduct.

3. Transfer the resulting values for S_1, S_2, S_3 and S_4 to table on page 3 of this worksheet.

Table 2. INDIVIDUAL SAFETY EVALUATIONS

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION				
2. HAZARDOUS AREAS		÷2		
3. MANUAL FIRE ALARM	÷2			
4. SMOKE DETECTION & ALARM	÷2			
5. AUTOMATIC SPRINKLERS		÷2(0)B	(÷2)A	
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2			
7. LIVING UNIT - BDRM DOORS & OPENINGS				
8. EGRESS FROM LIVING UNIT(s)				
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES		÷2		
10. EXIT SYSTEM			÷2	
11. EXIT ACCESS				
12. INTERIOR FINISH (egress routes)				
13. VERTICAL OPENINGS	÷2			
14. SMOKE CONTROL				
TOTAL	S_1 =	S_2 =	S_3 =	S_4 =

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 1c. Fire Safety Evaluation Worksheet

STEP 4. DETERMINE MANDATORY SAFETY REQUIREMENT VALUES - USE TABLE 3

A. Using the classification of the building (i.e., New, Rehabilitation or Existing) and the building height, circle the appropriate value in each of the four columns in Table 3.

B. Transfer the circled values for S_a, S_b, S_c, and S_d to the blanks marked S_a, S_b, S_c, and S_d in Table 4.

Table 3A. MANDATORY SAFETY REQUIREMENTS (multi-family housing)

BUILDING HEIGHT	CONTROL REQUIREMENT (S_a)		EGRESS REQUIREMENT (S_b)		REFUGE REQUIREMENT (S_c)		GENERAL FIRE SAFETY REQUIREMENT (S_d)	
	>8 UNITS/FLOOR	≤8 UNITS/FLOOR	>8 UNITS/FLOOR	≤8 UNITS/FLOOR	>8 UNITS/FLOOR	≤8 UNITS/FLOOR	>8 UNITS/FLOOR	≤8 UNITS/FLOOR
≤ 3 STORY	5.5	5.5	8	6	8	6	7	5
4-6 STORY	8	8	10	8	9	7	10	8
>6 STORY	10	10	10	8	11	9	12	10

Table 3B. MANDATORY SAFETY REQUIREMENTS (housing for the elderly)

BUILDING HEIGHT	CONTROL REQUIREMENT (S_a)		EGRESS REQUIREMENT (S_b)		REFUGE REQUIREMENT (S_c)		GENERAL FIRE SAFETY REQUIREMENT (S_d)	
	>8 UNITS/FLOOR	≤8 UNITS/FLOOR	>8 UNITS/FLOOR	≤8 UNITS/FLOOR	>8 UNITS/FLOOR	≤8 UNITS/FLOOR	>8 UNITS/FLOOR	≤8 UNITS/FLOOR
≤ 3 STORY	6.5	6.5	8	6	8	6	9	7
4-6 STORY	9	9	10	8	9	7	12	10
>6 STORY	11	11	10	8	11	9	14	12

Figure 1d-1. Fire Safety Evaluation Worksheet

Table 3C. MANDATORY SAFETY REQUIREMENTS (REHABILITATION MULTIFAMILY HOUSING)

BUILDING HEIGHT	CONTROL REQUIREMENT (S_a)		EGRESS REQUIREMENT (S_b)		REFUGE REQUIREMENT (S_c)		GENERAL FIRE SAFETY REQUIREMENT (S_d)	
	>8 UNITS/FLOOR	≤8 UNITS/FLOOR	>8 UNITS/FLOOR	≤8 UNITS/FLOOR	>8 UNITS/FLOOR	≤8 UNITS/FLOOR	>8 UNITS/FLOOR	≤8 UNITS/FLOOR
1-2 STORY	5.5	-5	5	-3	7	-4	4	-9
3 STORY	5.5	5.5	5	3	7	5	4	2
4-6 STORY	8	6	7	4	8	5	7	3
>6 STORY	10	8	7	4	10	7	9	5

Table 3D. MANDATORY SAFETY REQUIREMENTS (REHABILITATION ELDERLY HOUSING)

BUILDING HEIGHT	CONTROL REQUIREMENT (S_a)		EGRESS REQUIREMENT (S_b)		REFUGE REQUIREMENT (S_c)		GENERAL FIRE SAFETY REQUIREMENT (S_d)	
	>8 UNITS/FLOOR	≤8 UNITS/FLOOR	>8 UNITS/FLOOR	≤8 UNITS/FLOOR	>8 UNITS/FLOOR	≤8 UNITS/FLOOR	>8 UNITS/FLOOR	≤8 UNITS/FLOOR
1-2 STORY	6.5	-4	5	-3	7	-4	6	-7
3 STORY	6.5	6.5	5	-3	7	-4	6	4
4-6 STORY	9	7	7	4	8	5	9	5
>6 STORY	11	9	7	4	10	7	11	7

Table 3E. MANDATORY SAFETY REQUIREMENTS (EXISTING MULTIFAMILY & ELDERLY HOUSING)

BUILDING HEIGHT	CONTROL REQUIREMENT (S_a)		EGRESS REQUIREMENT (S_b)		REFUGE REQUIREMENT (S_c)		GENERAL FIRE SAFETY REQUIREMENT (S_d)	
	>8 UNITS/FLOOR	≤8 UNITS/FLOOR	>8 UNITS/FLOOR	≤8 UNITS/FLOOR	>8 UNITS/FLOOR	≤8 UNITS/FLOOR	>8 UNITS/FLOOR	≤8 UNITS/FLOOR
1-2 STORY	-5	-5	-5	-5	-5	-5	-11	-11
3 STORY	4	4	0	0	5	5	-1	-1
4-6 STORY	6.5	6.5	3	3	5	5	2	2
> 6 STORY	7.5	7.5	3	3	7	7	4	4

Figure 1d-2. Fire Safety Evaluation Worksheet

STEP 5 FIRE SAFETY EQUIVALENCY EVALUATION

A. Perform the indicated subtractions in Table 4. Enter the differences in the appropriate answer blocks.

B. For each row check "YES" if the value in the answer block is zero or greater. Check "NO" if the value in tne answer block is a negative number.

Table 4. FIRE SAFETY EQUIVALENCY EVALUATION

								YES	NO
CONTROL PROVIDED	(S_1)	less	REQUIRED CONTROL	(S_a)	≥ 0	S_1 □ − S_a □ = C □			
EGRESS PROVIDED	(S_2)	less	REQUIRED EGRESS	(S_b)	≥ 0	S_2 □ − S_b □ = D □			
REFUGE PROVIDED	(S_3)	less	REQUIRED REFUGE	(S_c)	≥ 0	S_3 □ − S_c □ = R □			
GENERAL FIRE SAFETY	(S_4)	less	REQUIRED GEN. FIRE SAFETY	(S_d)	≥ 0	S_4 □ − S_d □ = G □			

CONCLUSIONS:

1. [ ] All of the checks in Table 4 are in the "YES" column. The level of fire safety is at least equivalent to that prescribed by the Minimum Property Standards.*
2. [ ] One or more of the checks in Table 4 are in the "NO" column. The level of fire safety is not shown by this system to be equivalent to that prescribed by the Minimum Property Standards.

* The equivalency covered by this worksheet includes the majority of considerations covered by the Minimum Property Standards. There are a few considerations that are not evaluated by this method. These must be considered separately. These additional considerations are covered in Table 5.

This worksheet has been prepared by the Fire Safety Engineering Division, Center for Fire Research, NBS.

Figure 1e. Fire Safety Evaluation Worksheet

TABLE 5. BUILDING FIRE SAFETY REQUIREMENTS

(The following items are required by the MPS as fire safety features but are beyond the scope of equivalency evaluation of the Fire Safety Evaluation System. They must be accounted for separately.)

REQUIREMENTS	YES	NO
1. Access to the Roof (405-6.4). In buildings 3 or more stories in height, having slopes < 20 degrees, is adequate access provided?		
2. Balconies and Porches (405-11). Are balconies and porches non-combustible or meeting the limitations for combustible installations?		
3. Roof Covering (405-12). Does roof covering meet the classification requirements based on type of construction and building separation?		
4. Standpipes (405-15). Do buildings 5 stories or greater in height have class I service standpipes meeting NFPA No. 14?		
5. Mechanical System (515 & 615). Do mechanical systems (ventilation, heating, cooling, plumbing, water heating and gas piping) meet the requirement and referenced standards?		
6. Electrical (516 & 616). Does the electrical system meet the National Electrical Code?		
7. Elevator Capture (614-2.1). Are elevators equipped with emergency capture meeting the ANSI elevator Code?		
8. Areas per floors meet the limitations set in Table 4-5.2.		
9. In buildings requiring elevators (402-9.3), there is either one elevator in each smoke compartment or the elevator(s) are accessed through a lobby separated from each smoke compartment by 1-hr. wall with 3/4-hr. doors per 402-9.2.		
10. Incinerators and trash chutes conform with NFPA 82.		
11. The distance of travel to an exit stairway or exterior door from any point within a boiler room or a doorway to an exit corridor does not exceed 50 feet.		

Figure 1f. Fire Safety Evaluation Worksheet

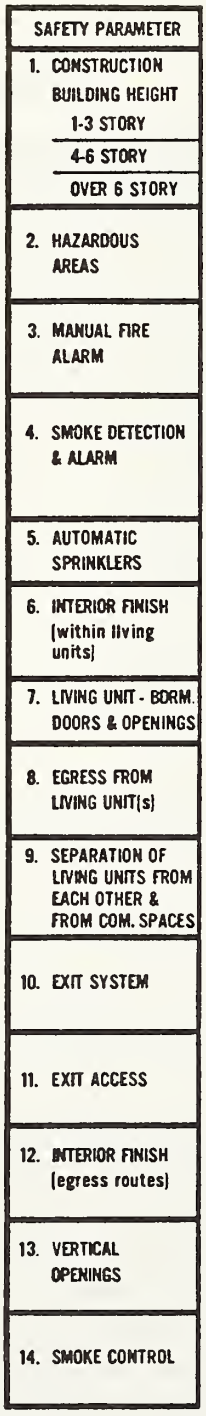
SAFETY PARAMETER
1. CONSTRUCTION
BUILDING HEIGHT
1-3 STORY
4-6 STORY
OVER 6 STORY
2. HAZARDOUS AREAS
3. MANUAL FIRE ALARM
4. SMOKE DETECTION & ALARM
5. AUTOMATIC SPRINKLERS
6. INTERIOR FINISH (within living units)
7. LIVING UNIT - BDRM. DOORS & OPENINGS
8. EGRESS FROM LIVING UNIT(s)
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES
10. EXIT SYSTEM
11. EXIT ACCESS
12. INTERIOR FINISH (egress routes)
13. VERTICAL OPENINGS
14. SMOKE CONTROL

Figure 2. Safety Parameters

SAFETY PARAMETER	PARAMETER VALUES								
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE			
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B NT.	TYPE 2-U	TYPE 2b	TYPES 1&2a	
1-3 STORY	−2	0	−2	0	−1	−2	2	2	
4-6 STORY	−8	−2	−8	0	−3	−5	2	2	
OVER 6 STORY	−10	−4	−10	−2	−4	−8	0	2	
2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE			OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY			
	DOUBLE DEFICIENCY		SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY				
	−7		−4	−4[−7]A		0			
3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM							
		w/o F.D. NOTIFICATION		w/ F.D. NOTIFICATION					
	−1	2		3					
4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM					
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING			
				EVERY LEVEL	EVERY BEDROOM				
	−4	0	2	3	4	6			
5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.		LIVING UNITS ONLY	CORRIDORS, MAB., & PUBLIC SPACES		TOTAL BUILDING		
	0	2[0]B		4[0]B	6		8		
6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS								
	>75 ≤ 200	>25 ≤ 75	≤ 25						
	−3	−1	0						
7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN.						
	−2	0	1						
8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS				
	>50' TRAV.	≤ 50'	>50' TRAV.	≤ 50' TRAV.					
	−2	−1	−1	0	1				
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN.		WALLS ≥20 MIN. < 1 HR. DOORS ≥20 MIN.		WALLS ≥1 HR. DOORS ≥20 MIN. w/ AC		WALLS ≥2 HR. DOORS ≥45 MIN. w/ AC	
		DOORS < 20 MIN.	DOORS ≥20 MIN.						
	−6	−2	0[−2]A	2[−2]A		4[−2]A		C	
10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES							
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT				
	−6[0]E	−2[0]E	0	2	4				
11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:					
	> 100'	50-100'	35-50'	>150'	100-150'	50-100'	< 50'		
	−6[0]D	−2	−1	−2	−1	0	2		
12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS								
	>75 ≤ 200	>25 ≤ 75	≤ 25						
	−3	−1	0						
13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED					
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥ 1 HR.				
	−10	−7	−2	0	2[0]A				
14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC				
					BY ZONE	BY UNIT/CORR.			
	0	2	2	3	3	4			

Figure 3. Safety Parameter Matrix

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B HT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	-2	0	-2	0	-1	-2	2	2
4-6 STORY	-8	-2	-8	0	-3	-5	2	2
OVER 6 STORY	-10	-4	-10	-2	-4	-8	0	2

2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE		OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	
	-7	-4	-4(-7)A	0	0

3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM	
		w/o F.D. NOTIFICATION	w/ F.D. NOTIFICATION
	-1	2	3

4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM		
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING
				EVERY LEVEL	EVERY BEDROOM	
	-4	0	2	3	4	6

5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.	LIVING UNITS ONLY	CORRIDORS, HAB., & PUBLIC SPACES	TOTAL BUILDING
	0	2(0)B	4(0)B	6	8

6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	-3	-1	0

7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN.
	-2	0	1

8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS
	>50' TRAV.	≤ 50	>50' TRAV.	≤ 50' TRAV.	
	-2	-1	-1	0	1

9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN.		WALLS ≥20 MIN. < 1 HR. DOORS ≥20 MIN.	WALLS ≥1 HR. DOORS ≥20 MIN. w/ AC	WALLS ≥2 HR. DOORS ≥45 MIN. w/ AC
		DOORS < 20 MIN	DOORS ≥20 MIN.			
	-6	-2	0(-2)A	2(-2)A	4(-2)A	C

10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES			
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT
	-6(0)E	-2(0)E	0	2	4

11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:			
	>100'	50-100'	35-50'	>150'	100-150'	50-100'	< 50'
	-6(0)D	-2	-1	-2	-1	0	2

12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	-3	-1	0

13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED	
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥ 1 HR.
	-10	-7	-2	0	2(0)A

14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC	
					BY ZONE	BY UNIT/CORR.
	0	2	2	3	3	4

Figure 4a. MPS Requirements
Multifamily Housing
≤ 3 story - > 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	0		0	0
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1	2		2
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	0	÷2(0)B 0	(÷2)A 0	0
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 -1.5			-3
7. LIVING UNIT - DOOR DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		0	÷2 0	0
11. EXIT ACCESS		0		0
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		2	2	2
TOTAL	S_1 = 5.5	S_2 = 8	S_3 = 8	S_4 = 7

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 4b. Mandatory Safety Requirements
Multifamily Housing
$\leq$ 3 story - > 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION BUILDING HEIGHT	COMBUSTIBLE					NONCOMBUSTIBLE		
	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B NT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	−2	0	−2	0	−1	−2	2	2
4-6 STORY	−8	−2	−8	0	−3	−5	2	2
OVER 6 STORY	−10	−4	−10	−2	−4	−8	0	2

2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE		OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	
	−7	−4	−4[−7]A	0	0

3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM	
		w/o F.D. NOTIFICATION	w/ F.D. NOTIFICATION
	−1	2	3

4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM		
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING
				EVERY LEVEL	EVERY BEDROOM	
	−4	0	2	3	4	6

5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.	LIVING UNITS ONLY	CORRIDORS, HAB., & PUBLIC SPACES	TOTAL BUILDING
	0	2[0]B	4[0]B	6	8

6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	−1	0

7. LIVING UNIT - DORM. DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN.
	−2	0	1

8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS
	>50' TRAV	≤ 50'	>50' TRAV	≤ 50' TRAV.	
	−2	−1	−1	0	1

9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN		WALLS ≥20 MIN. < 1 HR. DOORS ≥20 MIN	WALLS ≥1 HR. DOORS ≥20 MIN. w/ AC	WALLS ≥2 HR. DOORS ≥45 MIN. w/ AC
		DOORS < 20 MIN	DOORS ≥20 MIN.			
	−6	−2	0[−2]A	2[−2]A	4[−2]A	C

10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES			
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT
	−6[0]E	−2[0]E	0	2	4

11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:			
	> 100'	50-100'	35-50'	>150'	100-150'	50-100'	≤ 50'
	−6[0]B	−2	−1	−2	−1	0	2

12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	−1	0

13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED	
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥ 1 HR.
	−10	−7	−2	0	2[0]A

14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC	
					BY ZONE	BY UNIT/CORR.
	0	2	2	3	3	4

Figure 5a. MPS Requirements
Multifamily Housing
4-6 story - > 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	0		0	0
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1.5	3		3
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	2	÷2(0)B 1	(÷2)A1	2
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 -1.5			-3
7. LIVING UNIT - DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		0	÷2 0	0
11. EXIT ACCESS		0		0
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		2	2	2
TOTAL	S_1 = 8	S_2 = 10	S_3 = 9	S_4 = 10

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 5b. Mandatory Safety Requirements
Multifamily Housing
4-6 story > 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B NT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	−2	0	−2	0	−1	−2	2	2
4-6 STORY	−8	−2	−8	0	−3	−5	2	2
OVER 6 STORY	−10	−4	−10	−2	−4	−8	0	2
2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE			OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY		
	DOUBLE DEFICIENCY		SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY			
	−7		−4	−4[−7]A	0	0		
3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM						
		w/o F.D. NOTIFICATION		w. F.D. NOTIFICATION				
	−1	2		3				
4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM				
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING		
				EVERY LEVEL	EVERY BEDROOM			
	−4	0	2	3	4	6		
5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.		LIVING UNITS ONLY	CORRIDORS, MAB., & PUBLIC SPACES		TOTAL BUILDING	
	0	2[0]B		4[0]B	6		8	
6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS							
	>75 ≤ 200	>25 ≤ 75	≤ 25					
	−3	−1	0					
7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN.					
	−2	0	1					
8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS			
	>50' TRAV	≤ 50'	>50' TRAV.	≤ 50' TRAV.				
	−2	−1	−1	0	1			
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN.		WALLS ≥20 MIN. < 1 HR. DOORS ≥20 MIN.	WALLS ≥1 HR. DOORS ≥20 MIN. w/ AC	WALLS ≥2 HR. DOORS ≥45 MIN. w/ AC		
		DOORS < 20 MIN	DOORS ≥20 MIN					
	−6	−2	0[−2]A	2[−2]A	4[−2]A	C		
10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES						
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT			
	−6[0]E	−2[0]E	0	2	4			
11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:				
	>100'	50-100'	35-50'	>150'	100-150'	50-100'	< 50'	
	−6[0]B	−2	−1	−2	−1	0	2	
12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS							
	>75 ≤ 200	>25 ≤ 75	≤ 25					
	−3	−1	0					
13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED				
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥ 1 HR.			
	−10	−7	−2	0	2[0]A			
14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC			
					BY ZONE	BY UNIT/CORR.		
	0	2	2	3	3	4		

Figure 6a. MPS Requirements
Multifamily Housing
> 6 story - > 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	2		2	2
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1.5	3		3
4. SMOKE DETECTION & ALARM	÷2 2	2		2
5. AUTOMATIC SPRINKLERS	1	÷2(0)B 1	(÷2)A 1	2
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 1.5			-3
7. LIVING UNIT - DOOR DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		0	÷2 0	0
11. EXIT ACCESS		0		0
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		2	2	2
TOTAL	S_1 = 10	S_2 = 10	S_3 = 11	S_4 = 12

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 6b. Mandatory Safety Requirements
Multifamily Housing
> 6 story > 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B NT	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	−2	0	−2	0	−1	−2	2	2
4-6 STORY	−8	−2	−8	0	−3	−5	2	2
OVER 6 STORY	−10	−4	−10	−2	−4	−8	0	2
2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE			OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY		
	DOUBLE DEFICIENCY		SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	0		
	−7		−4	−4(−7)A	0			
3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM						
		w/o F.D. NOTIFICATION		w F.D. NOTIFICATION				
	−1	2		3				
4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM				
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING		
				EVERY LEVEL	EVERY BEDROOM			
	−4	0	2	3	4	6		
5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.		LIVING UNITS ONLY	CORRIDORS, MAS., & PUBLIC SPACES		TOTAL BUILDING	
	0	2(0)B		4(0)B	6		8	
6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS							
	75 ≤ 200	>25 ≤ 75	≤ 25					
	−3	−1	0					
7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN.					
	−2	0	1					
8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS			
	>50' TRAV	≤ 50'	>50' TRAV.	≤ 50' TRAV.				
	−2	−1	−1	0	1			
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN.		WALLS ≥20 MIN. < 1 HR. DOORS ≥20 MIN.	WALLS ≥1 HR. DOORS ≥20 MIN. w/ AC		WALLS ≥2 HR. DOORS ≥45 MIN. w/ AC	
		DOORS < 20 MIN.	DOORS ≥20 MIN.					
	−6	−2	0(−2)A	2(−2)A	4(−2)A		C	
10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES						
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT			
	−6(0)E	−2(0)E	0	2	4			
11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:				
	>100'	50-100'	35-50'	>150'	100-150'	50-100'	< 50'	
	−6(0)D	−2	−1	−2	−1	0	2	
12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS							
	>75 ≤ 200	>25 ≤ 75	≤ 25					
	−3	−1	0					
13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED				
	THRU 4 OR MORE FLOORS	2-3 FLRS	1 FLR.	< 1 HR.	≥ 1 HR.			
	−10	−7	−2	0	2(0)A			
14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC			
					BY ZONE	BY UNIT/CORR.		
	0	2	2	3	3	4		

Figure 7a. MPS Requirements
Multifamily Housing
≤ 3 story - ≤ 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	0		0	0
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1	2		2
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	0	÷2(0)B 0	(÷2)A 0	0
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 -1.5			-3
7. LIVING UNIT - DOOR DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		0	÷2 0	0
11. EXIT ACCESS		0		0
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		0	0	0
TOTAL	S_1 = 5.5	S_2 = 6	S_3 = 6	S_4 = 5

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 7b. Mandatory Safety Requirements
Multifamily Housing
$\leq$ 3 story $\leq$ 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B HT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	-2	0	-2	0	-1	-2	2	2
4-6 STORY	-8	-2	-8	0	-3	-5	2	2
OVER 6 STORY	-10	-4	-10	-2	-4	-8	0	2
2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE			OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY		
	DOUBLE DEFICIENCY		SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY			
	-7		-4	-4[-7]A	0	0		
3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM						
		w/o F.D. NOTIFICATION		w. F.D. NOTIFICATION				
	-1	2		3				
4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM				
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING		
				EVERY LEVEL	EVERY BEDROOM			
	-4	0	2	3	4	6		
5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.		LIVING UNITS ONLY	CORRIDORS, MAS., & PUBLIC SPACES		TOTAL BUILDING	
	0	2[0]B		4[0]B	6		8	
6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS							
	>75 ≤ 200	>25 ≤ 75	≤ 25					
	-3	-1	0					
7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN.					
	-2	0	1					
8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS			
	>50' TRAV	≤ 50	>50' TRAV.	≤ 50' TRAV.				
	-2	-1	-1	0	1			
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN.		WALLS ≥20 MIN. < 1 HR. DOORS ≥20 MIN.	WALLS ≥1 HR. DOORS ≥20 MIN. w/ AC		WALLS ≥ 2 HR. DOORS ≥45 MIN. w/ AC	
		DOORS < 20 MIN.	DOORS ≥20 MIN.					
	-6	-2	0[-2]A	2[-2]A	4[-2]A		C	
10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES						
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT			
	-6[0]E	-2[0]E	0	2	4			
11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:				
	>100'	50-100'	35-50'	>150'	100-150'	50-100'	< 50'	
	-6[0]D	-2	-1	-2	-1	0	2	
12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS							
	>75 ≤ 200	>25 ≤ 75	≤ 25					
	-3	-1	0					
13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED				
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥ 1 HR.			
	-10	-7	-2	0	2[0]A			
14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC			
					BY ZONE	BY UNIT/CORR.		
	0	2	2	3	3	4		

Figure 8a. MPS Requirements
Multifamily Housing
4-6 story - ≤ 8 unit/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	0		0	0
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1.5	3		3
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	2	÷2(0)B 1	(÷2)A 1	2
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 -1.5			-3
7. LIVING UNIT - BDRM DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		0	÷2 0	0
11. EXIT ACCESS		0		0
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		0	0	0
TOTAL	S_1 = 8	S_2 = 8	S_3 = 7	S_4 = 8

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 8b. Mandatory Safety Requirements
Multifamily Housing
4-6 story - $\leq$ 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B NT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	−2	0	−2	0	−1	−2	2	2
4-6 STORY	−8	−2	−8	0	−3	−5	2	2
OVER 6 STORY	−10	−4	−10	−2	−4	−8	0	2

2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE		OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	
	−7	−4	−4(−7)A	0	0

3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM	
		w/o F.D. NOTIFICATION	w F.D. NOTIFICATION
	−1	2	3

4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM		
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING
				EVERY LEVEL	EVERY BEDROOM	
	−4	0	2	3	4	6

5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.	LIVING UNITS ONLY	CORRIDORS, RMS., & PUBLIC SPACES	TOTAL BUILDING
	0	2(0)B	4(0)B	6	8

6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	−1	0

7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN.
	−2	0	1

8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS
	>50' TRAV.	≤ 50'	>50' TRAV.	≤ 50' TRAV.	
	−2	−1	−1	0	1

9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN.		WALLS ≥20 MIN. < 1 HR. DOORS ≥20 MIN.	WALLS ≥1 HR. DOORS ≥20 MIN. w/ AC	WALLS ≥2 HR. DOORS ≥45 MIN. w/ AC
		DOORS < 20 MIN.	DOORS ≥ 20 MIN.			
	−6	−2	0(−2)A	2(−2)A	4(−2)A	C

10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES			
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT
	−6(0)E	−2(0)E	0	2	4

11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:			
	>100'	50-100'	35-50'	>150'	100-150'	50-100'	< 50'
	−6(0)D	−2	−1	−2	−1	0	2

12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	−1	0

13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED	
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥ 1 HR.
	−10	−7	−2	0	2(0)A

14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC	
					BY ZONE	BY UNIT/CORR.
	0	2	2	3	3	4

Figure 9a. MPS Requirements
Multifamily Housing
> 6 story - ≤ 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	2		2	2
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1.5	3		3
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	2	÷2(0)B 1	(÷2)A 1	2
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 -1.5			-3
7. LIVING UNIT - BDRM DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		0	÷2 0	0
11. EXIT ACCESS		0		0
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		0	0	0
TOTAL	S_1 = 10	S_2 = 8	S_3 = 9	S_4 = 10

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 9b. Mandatory Safety Requirements
Multifamily Housing
> 6 story - $\leq$ 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 1&2&3b	TYPE 3B HT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	-2	0	-2	0	-1	-2	2	2
4-6 STORY	-8	-2	-8	0	-3	-5	2	2
OVER 6 STORY	-10	-4	-10	-2	-4	-8	0	2
2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE		OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY			
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY				
	-7	-4	-4(-7)A	0	0			
3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM						
		w/o F.D. NOTIFICATION	w/ F.D. NOTIFICATION					
	-1	2	3					
4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM				
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING		
				EVERY LEVEL	EVERY BEDROOM			
	-4	0	2	3	4	6		
5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.		LIVING UNITS ONLY	CORRIDORS, HAB., & PUBLIC SPACES		TOTAL BUILDING	
	0	2(0)B		4(0)B	6		8	
6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS							
	>75 ≤ 200	>25 ≤ 75	≤ 25					
	-3	-1	0					
7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MM	≥ 20 MM.					
	-2	0	1					
8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS			
	>50' TRAV.	≤ 50'	>50' TRAV.	≤ 50' TRAV.				
	-2	-1	-1	0	1			
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MM.		WALLS ≥20 MM. < 1 HR. DOORS ≥20 MM.	WALLS ≥1 HR. DOORS ≥20 MM. w/ AC	WALLS ≥2 HR. DOORS ≥45 MM. w/ AC		
		DOORS < 20 MM	DOORS ≥20 MM.					
	-6	-2	0(-2)A	2(-2)A	4(-2)A	C		
10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES						
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT			
	-6(0)E	-2(0)E	0	2	4			
11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:				
	>100'	50-100'	35-50'	>150'	100-150'	50-100'	<50'	
	-6(0)D	-2	-1	-2	-1	0	2	
12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS							
	>75 ≤ 200	>25 ≤ 75	≤ 25					
	-3	-1	0					
13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED				
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥ 1 HR.			
	-10	-7	-2	0	2(0)A			
14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC			
					BY ZONE	BY UNIT/CORR.		
	0	2	2	3	3	4		

Figure 10a. MPS Requirements
Housing for the Elderly
≤ 3 story - > 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	0		0	0
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1	2		2
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	0	÷2(0)B 0	(÷2)A 0	0
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 -.5			-1
7. LIVING UNIT - BDRM DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		0	÷2 0	0
11. EXIT ACCESS		0		0
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		2	2	2
TOTAL	S_1 = 6.5	S_2 = 8	S_3 = 8	S_4 = 9

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 10b. Mandatory Safety Requirements
Housing for the Elderly
$\leq$ 3 story - > 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B HT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	−2	0	−2	0	−1	−2	2	2
4-6 STORY	−8	−2	−8	0	−3	−5	2	2
OVER 6 STORY	−10	−4	−10	−2	−4	−8	0	2

2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE		OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	
	−7	−4	−4(−7)A	0	0

3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM	
		w/o F.D. NOTIFICATION	w F.D. NOTIFICATION
	−1	2	3

4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM		
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING
				EVERY LEVEL	EVERY BEDROOM	
	−4	0	2	3	4	6

5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.	LIVING UNITS ONLY	CORRIDORS, MAB., & PUBLIC SPACES	TOTAL BUILDING
	0	2(0)B	4(0)B	6	8

6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	−1	0

7. LIVING UNIT - DOOR DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN.
	−2	0	1

8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS
	>50' TRAV	≤ 50'	>50' TRAV	≤ 50' TRAV.	
	−2	−1	−1	0	1

9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN.		WALLS ≥20 MIN. < 1 HR. DOORS ≥20 MIN.	WALLS ≥1 HR. DOORS ≥20 MIN. w/ AC	WALLS ≥2 HR. DOORS ≥45 MIN. w/ AC
		DOORS < 20 MIN	DOORS ≥20 MIN.			
	−6	−2	0(−2)A	2(−2)A	4(−2)A	C

10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES			
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT
	−6(0)E	−2(0)E	0	2	4

11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:			
	> 100'	50 100'	35 50'	>150'	100 150'	50 100'	< 50'
	−6(0)D	−2	−1	−2	−1	0	2

12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	−1	0

13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED	
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥ 1 HR.
	−10	−7	−2	0	2(0)A

14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC	
					BY ZONE	BY UNIT/CORR.
	0	2	2	3	3	4

Figure 11a. MPS Requirements
Housing for the Elderly
4-6 story - > 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	0		0	0
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1.5	3		3
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	2	÷2(0)B 1	(÷2)A 1	2
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 -.5			-1
7. LIVING UNIT - BDRM DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		0	÷2 0	0
11. EXIT ACCESS		0		0
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		2	2	2
TOTAL	S_1 = 9	S_2 = 10	S_3 = 9	S_4 = 12

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 11b. Mandatory Safety Requirements
Housing for the Elderly
4-6 story > 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B NT	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	-2	0	-2	0	-1	-2	2	2
4-6 STORY	-8	-2	-8	0	-3	-5	2	2
OVER 6 STORY	-10	-4	-10	-2	-4	-8	0	2
2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE			OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY		
	DOUBLE DEFICIENCY		SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY			
	-7		-4	-4(-7)A	0	0		
3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM						
		w/o F.D. NOTIFICATION		w/ F.D. NOTIFICATION				
	-1	2		3				
4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM				
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING		
				EVERY LEVEL	EVERY BEDROOM			
	-4	0	2	3	4	6		
5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.		LIVING UNITS ONLY	CORRIDORS, HAB., & PUBLIC SPACES		TOTAL BUILDING	
	0	2(0)B		4(0)B	6		8	
6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS							
	>75 ≤ 200	>25 ≤ 75	≤ 25					
	-3	-1	0					
7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN.					
	-2	0	1					
8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS			
	>50' TRAV	≤ 50'	>50' TRAV	≤ 50' TRAV.				
	-2	-1	-1	0	1			
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN.		WALLS ≥20 MIN. < 1 HR. DOORS ≥20 MIN.	WALLS ≥1 HR. DOORS ≥20 MIN. w/ AC	WALLS ≥2 HR. DOORS ≥45 MIN. w/ AC		
		DOORS < 20 MIN	DOORS ≥20 MIN					
	-6	-2	0(-2)A	2(-2)A	4(-2)A	C		
10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES						
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT			
	-6(0)E	-2(0)E	0	2	4			
11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:				
	> 100'	50-100'	35-50'	>150'	100-150'	50-100'	< 50'	
	-6(0)D	-2	-1	-2	-1	0	2	
12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS							
	>75 ≤ 200	>25 ≤ 75	≤ 25					
	-3	-1	0					
13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED				
	THRU 4 OR MORE FLOORS	2-3 FLRS	1 FLR	< 1 HR.	≥ 1 HR.			
	-10	-7	-2	0	2(0)A			
14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC			
					BY ZONE	BY UNIT/CORR.		
	0	2	2	3	3	4		

Figure 12a. MPS Requirements
Housing for the Elderly
> 6 story - > 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	2		2	2
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1.5	3		3
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	2	÷2(0)B 1	(÷2)A 1	2
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 -.5			-1
7. LIVING UNIT - BDRM DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		0	÷2 0	0
11. EXIT ACCESS		0		0
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		2	2	2
TOTAL	S_1 = 11	S_2 = 10	S_3 = 11	S_4 = 14

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 12b. Mandatory Safety Requirements
Housing for the Elderly
> 6 story - > 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B NT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	−2	0	−2	0	−1	−2	2	2
4-6 STORY	−8	−2	−8	0	−3	−5	2	2
OVER 6 STORY	−10	−4	−10	−2	−4	−8	0	2
2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE			OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY		
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY		DOUBLE DEFICIENCY	SINGLE DEFICIENCY			
	−7	−4		−4[−7]A	0	0		
3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM						
		w/o F.D. NOTIFICATION		w F.D. NOTIFICATION				
	−1	2		3				
4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM				
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING		
				EVERY LEVEL	EVERY BEDROOM			
	−4	0	2	3	4	6		
5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.		LIVING UNITS ONLY	CORRIDORS, HAB., & PUBLIC SPACES		TOTAL BUILDING	
	0	2[0]B		4[0]B	6		8	
6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS							
	>75 ≤ 200	>25 ≤ 75	≤ 25					
	−3	−1	0					
7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN.					
	−2	0	1					
8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS			
	>50' TRAV	≤ 50'	>50' TRAV.	≤ 50' TRAV.				
	−2	−1	−1	0	1			
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN.		WALLS ≥20 MIN. < 1 HR. DOORS ≥20 MIN.	WALLS ≥1 HR. DOORS ≥20 MIN. w/ AC		WALLS ≥2 HR. DOORS ≥45 MIN. w/ AC	
		DOORS < 20 MIN	DOORS ≥20 MIN					
	−6	−2	0[−2]A	2[−2]A	0[−2]A		C	
10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES						
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT			
	−6[0]E	−2[0]E	0	2	4			
11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:				
	>100'	50-100'	35-50'	>150'	100-150'	50-100'	<50'	
	−6[0]B	−2	−1	−2	−1	0	2	
12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS							
	>75 ≤ 200	>25 ≤ 75	≤ 25					
	−3	−1	0					
13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED				
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥ 1 HR.			
	−10	−7	−2	0	2[0]A			
14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC			
					BY ZONE	BY UNIT/CORR.		
	0	2	2	3	3	4		

Figure 13a. MPS Requirements
Housing for the Elderly
≤ 3 story - ≤ 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	0		0	0
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1	2		2
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	0	÷2(0)B 0	(÷2)A 0	0
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 -.5			-1
7. LIVING UNIT - BDRM DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		0	÷2 0	0
11. EXIT ACCESS		0		0
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		0	0	0
TOTAL	S_1 = 6.5	S_2 = 6	S_3 = 6	S_4 = 7

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 13b. Mandatory Safety Requirements
Housing for the Elderly
$\leq$ 3 story - $\leq$ 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B HT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	−2	0	−2	0	−1	−2	2	2
4-6 STORY	−8	−2	−8	0	−3	−5	2	2
OVER 6 STORY	−10	−4	−10	−2	−4	−8	0	2

2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE		OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	
	−7	−4	−4(−7)A	0	0

3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM	
		w/o F.D. NOTIFICATION	w. F.D. NOTIFICATION
	−1	2	3

4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM		
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING
				EVERY LEVEL	EVERY BEDROOM	
	−4	0	2	3	4	6

5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.	LIVING UNITS ONLY	CORRIDORS, HAB., & PUBLIC SPACES	TOTAL BUILDING
	0	2(0)B	4(0)B	6	8

6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	−1	0

7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN.
	−2	0	1

8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS
	>50' TRAV	≤ 50'	>50' TRAV.	≤ 50' TRAV.	
	−2	−1	−1	0	1

9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN		WALLS ≥20 MIN. < 1 HR. DOORS ≥20 MIN.	WALLS ≥1 HR. DOORS ≥20 MIN. w/ AC	WALLS ≥2 HR. DOORS ≥45 MIN. w/ AC
		DOORS < 20 MIN.	DOORS ≥20 MIN.			
	−6	−2	0(−2)A	2(−2)A	4(−2)A	C

10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES			
		DEFICIENT	w/o HORIZ.	HORIZ EXIT	DIRECT EXIT
	−6(0)E	−2(0)E	0	2	4

11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:			
	>100'	50-100'	35-50'	>150'	100-150'	50-100'	< 50'
	−6(0)D	−2	−1	−2	−1	0	2

12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	−1	0

13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED	
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥ 1 HR.
	−10	−7	−2	0	2(0)A

14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC	
					BY ZONE	BY UNIT/CORR.
	0	2	2	3	3	4

Figure 14a. MPS Requirements
Housing for the Elderly
4-6 story - ≤ 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	0		0	0
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1.5	3		3
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	2	÷2(0)B 1	(÷2)A 1	2
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 -.5			-1
7. LIVING UNIT - DORM DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		0	÷2 0	0
11. EXIT ACCESS		0		0
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		0	0	0
TOTAL	S_1 = 9	S_2 = 8	S_3 = 7	S_4 = 10

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 14b. Mandatory Safety Requirements
Housing for the Elderly
4-6 story - $\leq$ 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B NT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	−2	0	−2	0	−1	−2	2	2
4-6 STORY	−8	−2	−8	0	−3	−5	2	2
OVER 6 STORY	−10	−4	−10	−2	−4	−8	0	2

2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE		OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	
	−7	−4	−4(−7)A	0	0

3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM	
		w/o F.D. NOTIFICATION	w/ F.D. NOTIFICATION
	−1	2	3

4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM		
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING
				EVERY LEVEL	EVERY BEDROOM	
	−4	0	2	3	4	6

5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.	LIVING UNITS ONLY	CORRIDORS, LIVING UNITS, & PUBLIC SPACES	TOTAL BUILDING
	0	2(0)B	4(0)B	6	8

6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	−1	0

7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN	≥ 20 MIN
	−2	0	1

8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS
	>50' TRAV	< 50'	>50' TRAV.	≤ 50' TRAV.	
	−2	−1	−1	0	1

9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN		WALLS ≥20 MIN. < 1 HR. DOORS ≥20 MIN	WALLS ≥1 HR. DOORS ≥20 MIN. w/ AC	WALLS ≥2 HR. DOORS ≥45 MIN. w/ AC
		DOORS < 20 MIN	DOORS ≥20 MIN.			
	−6	−2	0(−2)A	2(−2)A	4(−2)A	C

10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES			
		DEFICIENT	w/ HORIZ.	HORIZ. EXIT	DIRECT EXIT
	−6(0)E	−2(0)E	0	2	4

11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:			
	> 100'	50-100'	35-50'	>150'	100-150'	50-100'	< 50'
	−6(0)D	−2	−1	−2	−1	0	2

12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	−1	0

13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED	
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥ 1 HR.
	−10	−7	−2	0	2(0)A

14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC	
					BY ZONE	BY UNIT/CORR.
	0	2	2	3	3	4

Figure 15a. MPS Requirements
Housing for the Elderly
> 6 story - ≤ 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	2		2	2
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1.5	3		3
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	2	÷2(0)B 1	(÷2)A 1	2
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 -.5			-1
7. LIVING UNIT - DOOR DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		0	÷2 0	0
11. EXIT ACCESS		0		0
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		0	0	0
TOTAL	S_1 = 11	S_2 = 8	S_3 = 9	S_4 = 12

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 15b. Mandatory Safety Requirements
Housing for the Elderly
> 6 story $\leq$ 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION BUILDING HEIGHT	COMBUSTIBLE					NONCOMBUSTIBLE		
	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B HT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	−2	0	−2	0	−1	−2	2	2
4-6 STORY	−8	−2	−8	0	−3	−5	2	2
OVER 6 STORY	−10	−4	−10	−2	−4	−8	0	2
2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE		OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY			
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY				
	−7	−4	−4(−7)A	0	0			
3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM						
		w/o F.D. NOTIFICATION	w/ F.D. NOTIFICATION					
	−1	2	3					
4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM				
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING		
				EVERY LEVEL	EVERY BEDROOM			
	−4	0	2	3	4	6		
5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.	LIVING UNITS ONLY	CORRIDORS, HAB., & PUBLIC SPACES		TOTAL BUILDING		
	0	2(0)B	4(0)B	6		8		
6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS							
	>75 ≤ 200	>25 ≤ 75	≤ 25					
	−3	−1	0					
7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN.					
	−2	0	1					
8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS			
	>50' TRAV	≤ 50	>50' TRAV	≤ 50' TRAV.				
	−2	−1	−1	0	1			
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN.		WALLS ≥20 MIN. < 1 HR. DOORS ≥20 MIN.		WALLS ≥1 HR. DOORS ≥20 MIN. w/ AC		WALLS ≥2 HR. DOORS ≥45 MIN. w/ AC
		DOORS < 20 MIN	DOORS ≥20 MIN.					
	−6	−2	0(−2)A	2(−2)A		4(−2)A		C
10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES						
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT			
	−6(0)E	2(0)E	0	2	4			
11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:				
	> 100'	50-100'	35-50'	>150'	100-150'	50-100'	< 50'	
	−6(0)D	−2	−1	−2	−1	0	2	
12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS							
	>75 ≤ 200	>25 ≤ 75	≤ 25					
	−3	−1	0					
13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED				
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥ 1 HR.			
	−10	−7	−2	0	2(0)A			
14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC			
					BY ZONE	BY UNIT/CORR.		
	0	2	2	3	3	4		

Figure 16a. MPS Requirements
Rehab. Multifamily Housing
≤ 3 story - > 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	0		0	0
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1	2		2
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	0	÷2(0)B 0	(÷2)A 0	0
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 -1.5			-3
7. LIVING UNIT - BDRM DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		-2	÷2 -1	-2
11. EXIT ACCESS		-1		-1
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		2	2	2
TOTAL	S_1 = 5.5	S_2 = 5	S_3 = 7	S_4 = 4

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 16b. Mandatory Safety Requirements
Rehab. Multifamily Housing
$\leq$ 3 story - > 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION BUILDING HEIGHT	COMBUSTIBLE					NONCOMBUSTIBLE		
	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B HT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	−2	0	−2	0	−1	−2	2	2
4-6 STORY	−8	−2	−8	0	−3	−5	2	2
OVER 6 STORY	−10	−4	−10	−2	−4	−8	0	2
2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE		OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY			
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY				
	−7	−4	−4(−7)A	0	0			
3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM						
		w/o F.D. NOTIFICATION	w/ F.D. NOTIFICATION					
	−1	2	3					
4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM				
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING		
				EVERY LEVEL	EVERY BEDROOM			
	−4	0	2	3	4	6		
5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.		LIVING UNITS ONLY	CORRIDORS, HAB., & PUBLIC SPACES		TOTAL BUILDING	
	0	2(0)B		4(0)B	6		8	
6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS							
	>75 ≤ 200	>25 ≤ 75	≤ 25					
	−3	−1	0					
7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	> 20 MIN.	≥ 20 MIN					
	−2	0	1					
8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS			
	>50' TRAV	≤ 50'	>50' TRAV.	≤ 50' TRAV				
	−2	−1	−1	0	1			
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN		WALLS ≥20 MIN < 1 HR DOORS ≥20 MIN	WALLS ≥1 HR DOORS ≥20 MIN w/ AC	WALLS ≥2 HR DOORS ≥45 MIN w AC		
		DOORS < 20 MIN.	DOORS ≥20 MIN					
	−6	−2	0(−2)A	2(−2)A	4(−2)A	C		
10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES						
		EFFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT			
	−6(0)E	−2(0)E	0	2	4			
11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:				
	>100'	50-100'	35-50'	>150'	100-150'	50-100'	<50'	
	−6(0)D	−2	−1	−2	−1	0	2	
12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS							
	>75 ≤ 200	>25 ≤ 75	≤ 25					
	−3	−1	0					
13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED				
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥ 1 HR.			
	−10	−7	−2	0	2(0)A			
14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC			
					BY ZONE	BY UNIT CORR.		
	0	2	2	3	3	4		

Figure 17a. MPS Requirements
Rehab. Multifamily Housing
4-6 story - > 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	0		0	0
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1.5	3		3
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	2	÷2(0)B 1	(÷2)A 1	2
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 -1.5			-3
7. LIVING UNIT - BDRM DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		-2	÷2 -1	-2
11. EXIT ACCESS		-1		-1
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		2	2	2
TOTAL	S_1 = 8	S_2 = 7	S_3 = 8	S_4 = 7

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 17b. Mandatory Safety Requirements
Rehab. Multifamily Housing
4-6 story - > 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION / BUILDING HEIGHT	COMBUSTIBLE					NONCOMBUSTIBLE		
	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B HT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	-2	0	-2	0	-1	-2	2	2
4-6 STORY	-8	-2	-8	0	-3	-5	2	2
OVER 6 STORY	-10	-4	-10	-2	-4	-8	0	2

2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE		OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	
	-7	-4	-4(-7)A	0	0

3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM	
		w/o F.D. NOTIFICATION	w. F.D. NOTIFICATION
	-1	2	3

4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM		
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING
				EVERY LEVEL	EVERY BEDROOM	
	-4	0	2	3	4	6

5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.	LIVING UNITS ONLY	CORRIDORS, HAB., & PUBLIC SPACES	TOTAL BUILDING
	0	2(0)B	4(0)B	6	8

6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	-3	-1	0

7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN	≥ 20 MIN
	-2	0	1

8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS
	>50' TRAV.	≤ 50'	>50' TRAV.	≤ 50' TRAV.	
	-2	-1	-1	0	1

9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN.		WALLS ≥20 MIN. < 1 HR. DOORS ≥20 MIN	WALLS ≥1 HR. DOORS ≥20 MIN. w/ AC	WALLS ≥ 2 HR. DOORS ≥45 MIN. w/ AC
		DOORS < 20 MIN.	DOORS ≥20 MIN.			
	-6	-2	0(-2)A	2(-2)A	4(-2)A	C

10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES			
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT
	-6(0)E	-2(0)E	0	2	4

11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS			
	> 100'	50-100'	35-50'	>150'	100-150'	50-100'	< 50'
	-6(0)D	-2	-1	-2	-1	0	2

12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	-3	-1	0

13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED	
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥ 1 HR.
	-10	-7	-2	0	2(0)A

14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH ASSISTED AUTOMATIC	
					BY ZONE	BY UNIT, CORR.
	0	2	2	3	3	4

Figure 18a. MPS Requirements
Rehab. Multifamily Housing
> 6 story - > 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	2		2	2
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1.5	3		3
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	2	÷2(0)B 1	(÷2)A 1	2
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 -1.5			-3
7. LIVING UNIT - BDRM DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		-2	÷2 -1	-2
11. EXIT ACCESS		-1		-1
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		2	2	2
TOTAL	S_1 = 10	S_2 = 7	S_3 = 10	S_4 = 9

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 18b. Mandatory Safety Requirements
Rehab. Multifamily Housing
> 6 story - > 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION BUILDING HEIGHT	COMBUSTIBLE					NONCOMBUSTIBLE		
	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B HT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	(−2)	0	−2	0	−1	−2	2	2
4-6 STORY	−8	−2	−8	0	−3	−5	2	2
OVER 6 STORY	−10	−4	−10	−2	−4	−8	0	2

2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE		OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	
	−7	−4	−4|−7|A	0	(0)

3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM	
		w/o F.D. NOTIFICATION	w. F.D. NOTIFICATION
	(−1)	2	3

4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM		
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING
				EVERY LEVEL	EVERY BEDROOM	
	−4	0	(2)	3	4	6

5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.	LIVING UNITS ONLY	CORRIDORS, HAD., & PUBLIC SPACES	TOTAL BUILDING
	(0)	2|0|B	4|0|B	6	8

6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	(−3)	−1	0

7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN
	−2	(0)	1

8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS
	>50' TRAV.	≤ 50	>50' TRAV.	≤ 50' TRAV.	
	−2	(−1)	−1	0	1

9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN.		WALLS ≥20 MIN. < 1 HR DOORS ≥20 MIN.	WALLS ≥1 HR. DOORS ≥20 MIN. w AC	WALLS ≥ 2 HR. DOORS ≥45 MIN. w AC
		DOORS < 20 MIN.	DOORS ≥20 MIN.			
	−6	−2	0|−2|A	2|−2|A	4|−2|A	C

10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES			
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT
	−6|0|E	−2|0|E	(0)	2	4

11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS.			
	>100'	50-100'	35-50	>150'	100-150'	50-100'	<50'
	−6|0|D	−2	(−1)	−2	−1	0	2

12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	(−1)	0

13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED	
	THRU 4 OR MORE FLOORS	2-3 FLRS	1 FLR	< 1 HR.	≥ 1 HR
	−10	−7	−2	(0)	2|0|A

14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC	
					BY ZONE	BY UNIT CORR.
	(0)	2	2	3	3	4

Figure 19a. MPS Requirements
Rehab. Multifamily Housing
1-2 story - ≤ 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	-2		-2	-2
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 - .5	-1		-1
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	0	÷2(0)B 0	(÷2)A 0	0
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 -1.5			-3
7. LIVING UNIT - DOOR DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	-2	÷2 -1	-2	-2
10. EXIT SYSTEM		0	÷2 0	0
11. EXIT ACCESS		-1		-1
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 0	0	0	0
14. SMOKE CONTROL		0	0	0
TOTAL	S_1 = -5	S_2 = -3	S_3 = -4	S_4 = -9

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 19b. Mandatory Safety Requirements
Rehab. Multifamily Housing
1-2 story - $\leq$ 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B HT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	−2	0	−2	0	−1	−2	2	2
4-6 STORY	−8	−2	−8	0	−3	−5	2	2
OVER 6 STORY	−10	−4	−10	−2	−4	−8	0	2

2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE		OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	
	−7	−4	−4|−7|A	0	0

3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM	
		w/o F.D. NOTIFICATION	w F.D. NOTIFICATION
	−1	2	3

4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM		
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING
				EVERY LEVEL	EVERY BEDROOM	
	−4	0	2	3	4	6

5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.	LIVING UNITS ONLY	CORRIDORS, HAB., & PUBLIC SPACES	TOTAL BUILDING
	0	2|0|B	4|0|B	6	8

6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	−1	0

7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN
	−2	0	1

8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS
	>50' TRAV.	≤ 50	>50' TRAV	≤ 50' TRAV	
	−2	−1	−1	0	1

9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN.		WALLS ≥20 MIN. < 1 HR. DOORS ≥20 MIN	WALLS ≥1 HR. DOORS ≥20 MIN w/ AC	WALLS ≥2 HR. DOORS ≥45 MIN. w/ AC
		DOORS < 20 MIN.	DOORS ≥20 MIN.			
	−6	−2	0|−2|A	2|−2|A	4|−2|A	C

10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES			
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT
	−6|0|E	−2|0|E	0	2	4

11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:			
	> 100'	50-100'	35-50'	>150'	100-150'	50-100'	< 50'
	−6|0|D	−2	−1	−2	−1	0	2

12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	−1	0

13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED	
	THRU 4 OR MORE FLOORS	2-3 FLRS	1 FLR	< 1 HR	≥ 1 HR
	−10	−7	−2	0	2|0|A

14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC	
					BY ZONE	BY UNIT CORR
	0	2	2	3	3	4

Figure 20a. MPS Requirements
Rehab. Multifamily Housing
3 story - ≤ 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	0		0	0
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1	2		2
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	0	÷2(0)B 0	(÷2)A 0	0
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 -1.5			-3
7. LIVING UNIT - DOOR DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		-2	÷2 -1	-2
11. EXIT ACCESS		-1		-1
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		0	0	0
TOTAL	S_1 = 5.5	S_2 = 3	S_3 = 5	S_4 = 2

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 20b. Mandatory Safety Requirements
Rehab. Multifamily Housing
3 story - $\leq$ 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B HT.	TYPE 2-U	TYPE 2h	TYPES 1&2a
1-3 STORY	−2	0	−2	0	−1	−2	2	2
4-6 STORY	−8	−2	−8	0	−3	−5	2	2
OVER 6 STORY	−10	−4	−10	−2	−4	−8	0	2

2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE		OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	
	−7	−4	−4[−7]A	0	0

3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM	
		w/o F.D. NOTIFICATION	w/ F.D. NOTIFICATION
	−1	2	3

4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM		
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING
				EVERY LEVEL	EVERY BEDROOM	
	−4	0	2	3	4	6

5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.	LIVING UNITS ONLY	CORRIDORS, HAB., & PUBLIC SPACES	TOTAL BUILDING
	0	2[0]B	4[0]B	6	8

6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	−1	0

7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN.
	−2	0	1

8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS
	>50' TRAV.	≤ 50'	>50' TRAV.	≤ 50' TRAV.	
	−2	−1	−1	0	1

9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN		WALLS ≥20 MIN. < 1 HR. DOORS ≥20 MIN	WALLS ≥1 HR. DOORS ≥20 MIN. w AC	WALLS ≥2 HR DOORS ≥45 MIN w AC
		DOORS < 20 MIN.	DOORS ≥20 MIN.			
	−6	−2	0[−2]A	2[−2]A	4[−2]A	C

10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES			
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT
	−6[0]E	−2[0]E	0	2	4

11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:			
	> 100'	50-100'	35-50'	>150'	100-150'	50-100'	< 50'
	−6[0]D	−2	−1	−2	−1	0	2

12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	−1	0

13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED	
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥ 1 HR.
	−10	−7	−2	0	2[0]A

14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC	
					BY ZONE	BY UNIT CORR.
	0	2	2	3	3	4

Figure 21a. MPS Requirements
Rehab. Multifamily Housing
4-6 story - ≤ 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	0		0	0
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1.5	3		3
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	0	÷2(0)B 0	(÷2)A 0	0
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 -1.5			-3
7. LIVING UNIT - BDRM DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		-2	÷2 -1	-2
11. EXIT ACCESS		-1		-1
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		0	0	0
TOTAL	S_1 = 6	S_2 = 4	S_3 = 5	S_4 = 3

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 21b. Mandatory Safety Requirements
Rehab. Multifamily Housing
4-6 story - $\leq$ 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B HT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	−2	0	−2	0	−1	−2	2	2
4-6 STORY	−8	−2	−8	0	−3	−5	2	2
OVER 6 STORY	−10	−4	−10	−2	−4	−8	0	2

2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE		OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	
	−7	−4	−4(−7)A	0	0

3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM	
		w/o F.O. NOTIFICATION	w/ F.O. NOTIFICATION
	−1	2	3*

4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM		
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING
				EVERY LEVEL	EVERY BEDROOM	
	−4	0	2	3	4	6

5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.	LIVING UNITS ONLY	CORRIDORS, HAB., & PUBLIC SPACES	TOTAL BUILDING
	0	2(0)B	4(0)B	6	8

6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	−1	0

7. LIVING UNIT - DOOR, DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN.
	−2	0	1

8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS
	>50' TRAV.	≤ 50'	>50' TRAV.	≤ 50' TRAV.	
	−2	−1	−1	0	1

9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN.		WALLS ≥20 MIN. < 1 HR. DOORS ≥20 MIN.	WALLS ≥1 HR. DOORS ≥20 MIN w/ AC	WALLS ≥2 HR. DOORS ≥45 MIN w/ AC
		DOORS < 20 MIN.	DOORS ≥20 MIN.			
	−6	−2	0(−2)A	2(−2)A	4(−2)A	C

10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES			
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT
	−6(0)E	−2(0)E	0	2	4

11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS.			
	>100'	50-100'	35-50'	>150'	100-150'	50-100'	<50'
	−6(0)D	−2	−1	−2	−1	0	2

12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	−1	0

13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED	
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥ 1 HR.
	−10	−7	−2	0	2(0)A

14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC	
					BY ZONE	BY UNIT/CORR.
	0	2	2	3	3	4

Figure 22a. MPS Requirements
Rehab. Multifamily Housing
> 6 story - ≤ 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	2		2	2
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1.5	3		3
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	0	÷2(0)B 0	(÷2)A 0	0
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 -1.5			-3
7. LIVING UNIT - BDRM DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		-2	÷2 -1	-2
11. EXIT ACCESS		-1		-1
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		0	0	0
TOTAL	S_1 = 8	S_2 = 4	S_3 = 7	S_4 = 5

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 22b. Mandatory Safety Requirements
Rehab. Multifamily Housing
> 6 story - $\leq$ 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B HT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	-2	0	-2	0	-1	-2	2	2
4-6 STORY	-8	-2	-8	0	-3	-5	2	2
OVER 6 STORY	-10	-4	-10	-2	-4	-8	0	2
2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE			OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY		
	DOUBLE DEFICIENCY		SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	0		
	-7		-4	-4(-7)A	0			
3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM						
		w/o F.D. NOTIFICATION		w/ F.D. NOTIFICATION				
	-1	2		3				
4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM				
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING		
				EVERY LEVEL	EVERY BEDROOM			
	-4	0	2	3	4	6		
5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.		LIVING UNITS ONLY	CORRIDORS, HAB., & PUBLIC SPACES		TOTAL BUILDING	
	0	2(0)B		4(0)B	6		8	
6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS							
	>75 ≤ 200	>25 ≤ 75	≤ 25					
	-3	-1	0					
7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN.					
	-2	0	1					
8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS			
	>50' TRAV	≤ 50	>50' TRAV.	≤ 50' TRAV.				
	-2	-1	-1	0	1			
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN.		WALLS ≥20 MIN < 1 HR. DOORS ≥20 MIN	WALLS ≥1 HR. DOORS ≥20 MIN w/ AC	WALLS ≥2 HR. DOORS ≥45 MIN. w/ AC		
		DOORS < 20 MIN.	DOORS ≥20 MIN.					
	-6	-2	0(-2)A	2(-2)A	4(-2)A	C		
10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES						
		DEFICIENT	w/o HORIZ.	HORIZ EXIT	DIRECT EXIT			
	-6(0)E	-2(0)B	0	2	4			
11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:				
	>100'	50-100'	35-50'	>150'	100-150'	50-100'	<50'	
	-6(0)D	-2	-1	-2	-1	0	2	
12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS							
	>75 ≤ 200	>25 ≤ 75	≤ 25					
	-3	-1	0					
13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED				
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥1 HR.			
	-10	-7	-2	0	2(0)A			
14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC			
					BY ZONE	BY UNIT/CORR.		
	0	2	2	3	3	4		

Figure 23a. MPS Requirements
Rehab. Housing for the Elderly
≤ 3 story - > 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	0		0	0
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1	2		2
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	0	÷2(0)B 0	(÷2)A 0	0
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 - .5			-1
7. LIVING UNIT - BDRM DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		-2	÷2 -1	-2
11. EXIT ACCESS		-1		-1
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		2	2	2
TOTAL	S_1 = 6.5	S_2 = 5	S_3 = 7	S_4 = 6

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 23b. Mandatory Safety Requirements
Rehab. Housing for the Elderly
$\leq$ 3 story - > 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B HT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	-2	0	-2	0	-1	-2	2	2
4-6 STORY	-8	-2	-8	0	-3	-5	2	2
OVER 6 STORY	-10	-4	-10	-2	-4	-8	0	2

2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE		OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	
	-7	-4	-4(-7)A	0	0

3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM	
		w/o F.D. NOTIFICATION	w/ F.D. NOTIFICATION
	-1	2	3

4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM		
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING
				EVERY LEVEL	EVERY BEDROOM	
	-4	0	2	3	4	6

5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.	LIVING UNITS ONLY	CORRIDORS, HAB., & PUBLIC SPACES	TOTAL BUILDING
	0	2(0)B	4(0)B	6	8

6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	-3	-1	0

7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN.
	-2	0	1

8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS
	>50' TRAV.	≤ 50'	>50' TRAV.	≤ 50' TRAV.	
	-2	-1	-1	0	1

9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN.		WALLS ≥20 MIN < 1 HR. DOORS ≥20 MIN.	WALLS ≥1 HR. DOORS ≥20 MIN w/ AC	WALLS ≥2 HR. DOORS ≥45 MIN w AC
		DOORS < 20 MIN.	DOORS ≥ 20 MIN			
	-6	-2	0(-2)A	2(-2)A	4(-2)A	C

10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES			
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT
	-6(0)E	-2(0)E	0	2	4

11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:			
	>100'	50-100'	35-50'	>150'	100-150'	50-100'	< 50'
	-6(0)D	-2	-1	-2	-1	0	2

12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	-3	-1	0

13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED	
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥ 1 HR.
	-10	-7	-2	0	2(0)A

14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC	
					BY ZONE	BY UNIT CORR.
	0	2	2	3	3	4

Figure 24a. MPS Requirements
Rehab. Housing for the Elderly
4-6 story - > 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	0		0	0
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1.5	3		3
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	2	÷2(0)B 1	(÷2)A 1	2
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 -.5			-1
7. LIVING UNIT - BDRM DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		-2	÷2 -1	-2
11. EXIT ACCESS		-1		-1
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		2	2	2
TOTAL	S_1 = 9	S_2 = 7	S_3 = 8	S_4 = 9

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 24b. Mandatory Safety Requirements
Rehab. Housing for the Elderly
4-6 story - > 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B HT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	−2	0	−2	0	−1	−2	2	2
4-6 STORY	−8	−2	−8	0	−3	−5	2	2
OVER 6 STORY	−10	−4	−10	−2	−4	−8	0	2

2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE		OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	
	−7	−4	−4(−7)A	0	0

3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM	
		w/o F.D. NOTIFICATION	w F.D. NOTIFICATION
	−1	2	3

4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM		
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING
				EVERY LEVEL	EVERY BEDROOM	
	−4	0	2	3	4	6

5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.	LIVING UNITS ONLY	CORRIDORS, HAB., & PUBLIC SPACES	TOTAL BUILDING
	0	2(0)B	4(0)B	6	8

6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	−1	0

7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN.
	−2	0	1

8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS
	>50' TRAV.	≤ 50'	>50' TRAV.	≤ 50' TRAV.	
	−2	−1	−1	0	1

9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN.		WALLS ≥20 MIN. < 1 HR. DOORS ≥20 MIN.	WALLS ≥1 HR DOORS ≥20 MIN w AC	WALLS ≥2 HR. DOORS ≥45 MIN. w AC
		DOORS < 20 MIN.	DOORS ≥20 MIN.			
	−6	−2	0(−2)A	2(−2)A	4(−2)A	C

10. EXIT SYSTEM	< 2 STANDARD RDUTES	MULTIPLE STANDARD RDUTES			
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT
	−6(0)E	−2(0)E	0	2	4

11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS.			
	> 100'	50-100'	35-50'	>150'	100-150'	50-100'	< 50'
	−6(0)D	−2	−1	−2	−1	0	2

12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	−1	0

13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED	
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥ 1 HR.
	−10	−7	−2	0	2(0)A

14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC	
					BY ZONE	BY UNIT CORR.
	0	2	2	3	3	4

Figure 25a. MPS Requirements
Rehab. Housing for the Elderly
> 6 story - ≤ 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	2		2	2
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1.5	3		3
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	0	÷2(0)B 0	(÷2)A 0	0
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 - .5			-1
7. LIVING UNIT - DORM DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		-2	÷2 -1	-2
11. EXIT ACCESS		-1		-1
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		0	0	0
TOTAL	S_1 = 9	S_2 = 4	S_3 = 7	S_4 = 7

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 25b. Mandatory Safety Requirements
Rehab. Housing for the Elderly
> 6 story - $\leq$ 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B HT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	(-2)	0	-2	0	-1	-2	2	2
4-6 STORY	-8	-2	-8	0	-3	-5	2	2
OVER 6 STORY	-10	-4	-10	-2	-4	-8	0	2

2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE		OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	
	-7	-4	-4(-7)A	0	(0)

3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM	
		w/o F.D. NOTIFICATION	w. F.D. NOTIFICATION
	(-1)	2	3

4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM		
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING
				EVERY LEVEL	EVERY BEDROOM	
	-4	0	(2)	3	4	6

5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.	LIVING UNITS ONLY	CORRIDORS, HAB., & PUBLIC SPACES	TOTAL BUILDING
	(0)	2(0)B	4(0)B	6	8

6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	-3	(-1)	0

7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN.
	-2	(0)	1

8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS
	>50' TRAV.	≤ 50'	>50' TRAV.	≤ 50' TRAV	
	-2	(-1)	-1	0	1

9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN.		WALLS ≥20 MIN < 1 HR. DOORS ≥20 MIN.	WALLS ≥1 HR. DOORS ≥20 MIN w/ AC	WALLS ≥2 HR. DOORS ≥45 MIN. w AC
		DOORS < 20 MIN	DOORS ≥20 MIN.			
	-6	-2	0(-2)A	2(-2)A	4(-2)A	C

10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES			
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT
	-6(0)E	-2(0)E	(0)	2	4

11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:			
	>100'	50-100'	35-50'	>150'	100-150'	50-100'	< 50'
	-6(0)D	-2	(-1)	-2	-1	0	2

12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	-3	(-1)	0

13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED	
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥ 1 HR.
	-10	-7	-2	(0)	2(0)A

14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC	
					BY ZONE	BY UNIT. CORR.
	(0)	2	2	3	3	4

Figure 26a. MPS Requirements
Rehab. Housing for the Elderly
1-2 story - $\leq$ 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	-2		-2	-2
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 - .5	-1		-1
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	0	÷2(0)B 0	(÷2)A 0	0
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 - .5			-1
7. LIVING UNIT - BDRM DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	-2	÷2 -1	-2	-2
10. EXIT SYSTEM		0	÷2 0	0
11. EXIT ACCESS		-1		-1
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 0	0	0	0
14. SMOKE CONTROL		0	0	0
TOTAL	S_1 = -4	S_2 = -3	S_3 = -4	S_4 = -7

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 26b. Mandatory Safety Requirements
Rehab. Housing for the Elderly
1-2 story - $\leq$ 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B HT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	−2	(0)	−2	0	−1	−2	2	2
4-6 STORY	−8	−2	−8	0	−3	−5	2	2
OVER 6 STORY	−10	−4	−10	−2	−4	−8	0	2

2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE		OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	
	−7	−4	−4(−7)A	0	(0)

3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM	
		w/o F.D. NOTIFICATION	w/ F.D. NOTIFICATION
	−1	(2)	3

4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM		
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING
				EVERY LEVEL	EVERY BEDROOM	
	−4	0	(2)	3	4	6

5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.	LIVING UNITS ONLY	CORRIDORS, HAB., & PUBLIC SPACES	TOTAL BUILDING
	(0)	2(0)B	4(0)B	6	8

6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	(−1)	0

7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN.
	−2	(0)	1

8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS
	>50' TRAV.	≤ 50'	>50' TRAV.	≤ 50' TRAV.	
	−2	(−1)	−1	0	1

9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN		WALLS ≥20 MIN < 1 HR. DOORS ≥20 MIN	WALLS ≥1 HR. DOORS ≥20 MIN. w/ AC	WALLS ≥2 HR DOORS ≥45 MIN. w AC
		DOORS < 20 MIN.	DOORS ≥ 20 MIN.			
	−6	−2	0(−2)A	2(−2)A	(4(−2)A)	C

10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES			
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT
	−6(0)E	(−2(0)E)	0	2	4

11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:			
	> 100'	50-100'	35-50'	>150'	100-150'	50-100'	< 50'
	−6(0)D	−2	(−1)	−2	−1	0	2

12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	(−1)	0

13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED	
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥1 HR.
	−10	−7	−2	0	(2(0)A)

14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC	
					BY ZONE	BY UNIT CORR.
	(0)	2	2	3	3	4

Figure 27a. MPS Requirements
Rehab. Housing for the Elderly
3 story - ≤ 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	0		0	0
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1	2		2
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	0	÷2(0)B 0	(÷2)A 0	0
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 - .5			-1
7. LIVING UNIT - BDRM DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		-2	÷2 -1	-2
11. EXIT ACCESS		-1		-1
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		0	0	0
TOTAL	S_1 = 6.5	S_2 = 3	S_3 = 5	S_4 = 4

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 27b. Mandatory Safety Requirements
Rehab. Housing for the Elderly
3 story - $\leq$ 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B HT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	−2	0	−2	0	−1	−2	2	2
4-6 STORY	−8	−2	−8	0	−3	−5	2	2
OVER 6 STORY	−10	−4	−10	−2	−4	−8	0	2

2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE		OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	
	−7	−4	−4|−7|A	0	0

3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM	
		w/o F.D. NOTIFICATION	w F.D. NOTIFICATION
	−1	2	3

4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM		
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING
				EVERY LEVEL	EVERY BEDROOM	
	−4	0	2	3	4	6

5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.	LIVING UNITS ONLY	CORRIDORS, HAB., & PUBLIC SPACES	TOTAL BUILDING
	0	2|0|B	4|0|B	6	8

6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS		
	>75 ≤200	>25 ≤75	≤ 25
	−3	−1	0

7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN.
	−2	0	1

8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS
	>50' TRAV.	≤ 50	>50' TRAV.	≤ 50' TRAV.	
	−2	−1	−1	0	1

9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN.		WALLS ≥20 MIN. < 1 HR. DOORS ≥20 MIN.	WALLS ≥1 HR. DOORS ≥20 MIN. w AC	WALLS ≥2 HR. DOORS ≥45 MIN w AC
		DOORS < 20 MIN.	DOORS ≥20 MIN.			
	−6	−2	0|−2|A	2|−2|A	4|−2|A	C

10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES			
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT
	−6|0|E	−2|0|E	0	2	4

11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS.			
	>100'	50-100'	35-50'	>150'	100-150'	50-100'	< 50'
	−6|0|D	−2	−1	−2	−1	0	2

12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤75	≤ 25
	−3	−1	0

13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED	
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥ 1 HR.
	−10	−7	−2	0	2|0|A

14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC	
					BY ZONE	BY UNIT CORR
	0	2	2	3	3	4

Figure 28a. MPS Requirements
Rehab. Housing for the Elderly
4-6 story - ≤ 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	0		0	0
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1.5	3		3
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	0	÷2(0)B 0	(÷2)A 0	0
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 - .5			-1
7. LIVING UNIT - BDRM DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		-2	÷2 -1	-2
11. EXIT ACCESS		-1		-1
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		0	0	0
TOTAL	S_1 = 7	S_2 = 4	S_3 = 5	S_4 = 5

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 28b. Mandatory Safety Requirements
Rehab. Housing for the Elderly
4-6 story - $\leq$ 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B HT.	TYPE 2-U	TYPE 2h	TYPES 1&2a
1-3 STORY	-2	0	-2	0	-1	-2	2	2
4-6 STORY	-8	-2	-8	0	-3	-5	2	2
OVER 6 STORY	-10	-4	-10	-2	-4	-8	0	2

2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE		OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	
	-7	-4	-4(-7)A	0	0

3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM	
		w/o F.D. NOTIFICATION	w F.D. NOTIFICATION
	-1	2	3

4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM		
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING
				EVERY LEVEL	EVERY BEDROOM	
	-4	0	2	3	4	6

5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.	LIVING UNITS ONLY	CORRIDORS, HAB., & PUBLIC SPACES	TOTAL BUILDING
	0	2(0)B	4(0)B	6	8

6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	-3	-1	0

7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN.
	-2	0	1

8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS
	>50' TRAV.	≤ 50'	>50' TRAV.	≤ 50' TRAV.	
	-2	-1	-1	0	1

9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN		WALLS ≥20 MIN. < 1 HR. DOORS ≥20 MIN.	WALLS ≥1 HR. DOORS ≥20 MIN. w/ AC	WALLS ≥2 HR. DOORS ≥45 MIN. w AC
		DOORS < 20 MIN.	DOORS ≥20 MIN.			
	-6	-2	0(-2)A	2(-2)A	3(-2)A	C

10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES			
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT
	-6(0)E	-2(0)E	0	2	4

11. EXIT ACCESS	DEAD END			NO DEAD END >35' & TRAVEL IS:			
	>100'	50-100'	35-50'	>150'	100-150'	50-100'	<50'
	-6(0)D	-2	-1	-2	-1	0	2

12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	-3	-1	0

13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED	
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥ 1 HR.
	-10	-7	-2	0	2(0)A

14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC	
					BY ZONE	BY UNIT CORR
	0	2	2	3	3	4

Figure 29a. MPS Requirements
Rehab. Housing for the Elderly
> 6 story - > 8 units/floor

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	2		2	2
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1.5	3		3
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	2	÷2(0)B 1	(÷2)A 1	2
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 - .5			-1
7. LIVING UNIT - BDRM DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		-2	÷2 -1	-2
11. EXIT ACCESS		-1		-1
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		2	2	2
TOTAL	S_1 = 11	S_2 = 7	S_3 = 10	S_4 = 11

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 29b. Mandatory Safety Requirements
Rehab. Housing for the Elderly
> 6 story - > 8 units/floor

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B HT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	(-2)	0	-2	0	-1	-2	2	2
4-6 STORY	-8	-2	-8	0	-3	-5	2	2
OVER 6 STORY	-10	-4	-10	-2	-4	-8	0	2

2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE		OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	
	-7	-4	-4(-7)A	0	(0)

3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM	
		w/o F.D. NOTIFICATION	w/ F.D. NOTIFICATION
	(-1)	2	3

4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM		
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING
				EVERY LEVEL	EVERY BEDROOM	
	-4	0	(2)	3	4	6

5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.	LIVING UNITS ONLY	CORRIDORS, HAB., & PUBLIC SPACES	TOTAL BUILDING
	(0)	2(0)B	4(0)B	6	8

6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	(-3)	-1	0

7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN	≥ 20 MIN.
	-2	(0)	1

8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS
	>50' TRAV.	≤ 50'	>50' TRAV.	≤ 50' TRAV.	
	-2	(-1)	-1	0	1

9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN		WALLS ≥20 MIN < 1 HR. DOORS ≥20 MIN	WALLS ≥1 HR. DOORS ≥20 MIN w AC	WALLS ≥2 HR. DOORS ≥45 MIN. w AC
		DOORS < 20 MIN.	DOORS ≥ 20 MIN.			
	-6	-2	0(-2)A	2(-2)A	4(-2)A	C

10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES			
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT
	-6(0)E	(-2(0)E)	0	2	4

11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:			
	> 100'	50-100'	35-50'	>150'	100-150'	50-100'	< 50'
	-6(0)D	-2	(-1)	-2	(-1)	0	2

12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	-3	(-1)	0

13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED	
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	1 HR.	≥1 HR.
	-10	-7	-2	(0)	2(0)A

14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC	
					BY ZONE	BY UNIT CORR.
	(0)	2	2	3	3	4

Figure 30a. MPS Requirements
Existing Multifamily and
Housing for the Elderly
1-2 story

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	−2		−2	−2
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 − .5	−1		−1
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	0	÷2(0)B 0	(÷2)A 0	0
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 −1.5			−3
7. LIVING UNIT - BDRM DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		−1		−1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	−2	÷2 −1	−2	−2
10. EXIT SYSTEM		−2	÷2 −1	−2
11. EXIT ACCESS		−1		−1
12. INTERIOR FINISH (egress routes)		−1		−1
13. VERTICAL OPENINGS	÷2 0	0	0	0
14. SMOKE CONTROL		0	0	0
TOTAL	S_1 = −5	S_2 = −5	S_3 = −5	S_4 = −11

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 30b. Mandatory Safety Requirements
Existing Multifamily and
Housing for the Elderly
1-2 story

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B HT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	-2	0	-2	0	-1	-2	2	2
4-6 STORY	-8	-2	-8	0	-3	-5	2	2
OVER 6 STORY	-10	-4	-10	-2	-4	-8	0	2
2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE			OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY		
	DOUBLE DEFICIENCY		SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY			
	-7		-4	-4(-7)A	0	0		
3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM						
		w/o F.D. NOTIFICATION		w/ F.D. NOTIFICATION				
	-1	2		3				
4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM				
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING		
				EVERY LEVEL	EVERY BEDROOM			
	-4	0	2	3	4	6		
5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.		LIVING UNITS ONLY	CORRIDORS, HAB., & PUBLIC SPACES		TOTAL BUILDING	
	0	2(0)B		4(0)B	6		8	
6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS							
	>76 ≤ 200	>25 ≤ 75	≤ 25					
	-3	-1	0					
7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN	≥ 20 MIN.					
	-2	0	1					
8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS			
	>50' TRAV.	≤ 50'	>50' TRAV.	≤ 50' TRAV.				
	-2	-1	-1	0	1			
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN		WALLS ≥20 MIN. < 1 HR. DOORS ≥20 MIN	WALLS ≥1 HR. DOORS ≥20 MIN. w AC	WALLS ≥2 HR. DOORS ≥45 MIN. w AC		
		DOORS < 20 MIN	DOORS ≥20 MIN.					
	-6	-2	0(-2)A	2(-2)A	4(-2)A	C		
10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES						
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT			
	-6(0)E	-2(0)E	0	2	4			
11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:				
	>100'	50-100'	35-50'	>150'	100-150'	50-100'	< 50'	
	-6(0)D	-2	-1	-2	-1	0	2	
12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS							
	>75 ≤ 200	>25 ≤ 75	≤ 25					
	-3	-1	0					
13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED				
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR	< 1 HR.	≥ 1 HR.			
	-10	-7	-2	0	2(0)A			
14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC			
					BY ZONE	BY UNIT CORR.		
	0	2	2	3	3	4		

Figure 31a. MPS Requirements
Existing Multifamily and
Housing for the Elderly
3 story

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	0		0	0
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 - .5	-1		-1
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	0	÷2(0)B 0	(÷2)A 0	0
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 -1.5			-3
7. LIVING UNIT - BDRM DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		-2	÷2 -1	-2
11. EXIT ACCESS		-1		-1
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		0	0	0
TOTAL	S_1 = 4	S_2 = 0	S_3 = 5	S_4 = -1

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 31b. Mandatory Safety Requirements
Existing Multifamily and
Housing for the Elderly
3 story

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B HT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	−2	0	−2	0	−1	−2	2	2
4-6 STORY	−8	−2	−8	0	−3	−5	2	2
OVER 6 STORY	−10	−4	−10	−2	−4	−8	0	2

2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE		OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	
	−7	−4	−4(−7)A	0	0

3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM	
		w/o F.D. NOTIFICATION	w/ F.D. NOTIFICATION
	−1	2	3

4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM		
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING
				EVERY LEVEL	EVERY BEDROOM	
	−4	0	2	3	4	6

5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.	LIVING UNITS ONLY	CORRIDORS, HAB., & PUBLIC SPACES	TOTAL BUILDING
	0	2(0)B	4(0)B	6	8

6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	−1	0

7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN.
	−2	0	1

8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS
	>50' TRAV.	≤ 50'	>50' TRAV.	≤ 50' TRAV.	
	−2	−1	−1	0	1

9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN.		WALLS ≥20 MIN. < 1 HR. DOORS ≥20 MIN.	WALLS ≥1 HR. DOORS ≥20 MIN. w/ AC	WALLS ≥2 HR. DOORS ≥45 MIN. w/ AC
		DOORS < 20 MIN.	DOORS ≥20 MIN.			
	−6	−2	0(−2)A	2(−2)A	4(−2)A	C

10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES			
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT
	−6(0)E	−2(0)E	0	2	4

11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:			
	>100'	50-100'	35-50'	>150'	100-150'	50-100'	< 50'
	−6(0)D	−2	−1	−2	−1	0	2

12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS		
	>75 ≤ 200	>25 ≤ 75	≤ 25
	−3	−1	0

13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED	
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR	< 1 HR.	≥ 1 HR.
	−10	−7	−2	0	2(0)A

14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC	
					BY ZONE	BY UNIT CORR.
	0	2	2	3	3	4

Figure 32a. MPS Requirements
Existing Multifamily and
Housing for the Elderly
4-6 story

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	0		0	0
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1	2		2
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	0	÷2(0)B 0	(÷2)A 0	0
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 -1.5			-3
7. LIVING UNIT - BDRM DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		-2	÷2 -1	-2
11. EXIT ACCESS		-1		-1
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		0	0	0
TOTAL	S_1 = 5.5	S_2 = 3	S_3 = 5	S_4 = 2

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 32b. Mandatory Safety Requirements
Existing Multifamily and
Housing for the Elderly
4-6 story

SAFETY PARAMETER	PARAMETER VALUES							
1. CONSTRUCTION	COMBUSTIBLE					NONCOMBUSTIBLE		
BUILDING HEIGHT	TYPE 4-U	TYPE 4	TYPE 3-U	TYPES 3a&3b	TYPE 3B HT.	TYPE 2-U	TYPE 2b	TYPES 1&2a
1-3 STORY	−2	0	−2	0	−1	−2	2	2
4-6 STORY	−8	−2	−8	0	−3	−5	2	2
OVER 6 STORY	−10	−4	−10	−2	−4	−8	0	2
2. HAZARDOUS AREAS	WITHIN LIVING UNITS OR ON EXIT ROUTE		OUTSIDE LIVING UNITS		NONE OR NO DEFICIENCY			
	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	DOUBLE DEFICIENCY	SINGLE DEFICIENCY				
	−7	−4	−4(−7)A	0	0			
3. MANUAL FIRE ALARM	NO ALARM	MANUAL ALARM						
		w/o F.D. NOTIFICATION	w. F.D. NOTIFICATION					
	−1	2	3					
4. SMOKE DETECTION & ALARM	NONE	SINGLE STATION LIVING UNITS ONLY		INTERCONNECTED SYSTEM				
		SINGLE LEVEL	EVERY LEVEL	LIVING UNITS ONLY		TOTAL BUILDING		
				EVERY LEVEL	EVERY BEDROOM			
	−4	0	2	3	4	6		
5. AUTOMATIC SPRINKLERS	NONE	CORRIDORS, PUBLIC SPACES, ETC.	LIVING UNITS ONLY	CORRIDORS, HAB., & PUBLIC SPACES		TOTAL BUILDING		
	0	2(0)B	4(0)B	6		8		
6. INTERIOR FINISH (within living units)	FLAME SPREAD RATINGS							
	>75 ≤200	>25 ≤75	≤ 25					
	−3	−1	0					
7. LIVING UNIT - BDRM. DOORS & OPENINGS	NO DOOR	< 20 MIN.	≥ 20 MIN.					
	−2	0	1					
8. EGRESS FROM LIVING UNIT(s)	SINGLE ROUTE		1 DOOR & ESCAPE WINDOWS		REMOTE EXITS			
	>50' TRAV.	≤ 50'	>50' TRAV.	≤ 50' TRAV.				
	−2	−1	−1	0	1			
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COM. SPACES	NONE OR INCOMPLETE	WALLS >20 MIN.		WALLS ≥20 MIN. < 1 HR. DOORS ≥20 MIN	WALLS ≥1 HR. DOORS ≥20 MIN. w/ AC	WALLS ≥2 HR. DOORS ≥45 MIN. w AC		
		DOORS < 20 MIN.	DOORS ≥20 MIN					
	−6	−2	0(−2)A	2(−2)A	4(−2)A	C		
10. EXIT SYSTEM	< 2 STANDARD ROUTES	MULTIPLE STANDARD ROUTES						
		DEFICIENT	w/o HORIZ.	HORIZ. EXIT	DIRECT EXIT			
	−6(0)E	−2(0)E	0	2	4			
11. EXIT ACCESS	DEAD END			NO DEAD END > 35' & TRAVEL IS:				
	>100'	50-100'	35-50'	>150'	100-150'	50-100'	< 50'	
	−6(0)D	−2	−1	−2	−1	0	2	
12. INTERIOR FINISH (egress routes)	FLAME SPREAD RATINGS							
	>75 ≤ 200	>25 ≤ 75	≤ 25					
	−3	−1	0					
13. VERTICAL OPENINGS	OPEN OR INCOMPLETE ENCLOSURE			ENCLOSED				
	THRU 4 OR MORE FLOORS	2-3 FLRS.	1 FLR.	< 1 HR.	≥ 1 HR.			
	−10	−7	−2	0	2(0)A			
14. SMOKE CONTROL	NO CONTROL	SMOKE PARTITION	SMOKE PRF. TOWER	SMOKE PART. & SMOKE TOWER	MECH. ASSISTED AUTOMATIC			
					BY ZONE	BY UNIT CORR.		
	0	2	2	3	3	4		

Figure 33a. MPS Requirements
Existing Multifamily and
Housing for the Elderly
> 6 story

SAFETY PARAMETER	FIRE CONTROL (S_1)	EGRESS PROVIDED (S_2)	REFUGE PROVIDED (S_3)	GENERAL FIRE SAFETY PROVIDED (S_4)
1. CONSTRUCTION	2		2	2
2. HAZARDOUS AREAS	0	÷2 0	0	0
3. MANUAL FIRE ALARM	÷2 1	2		2
4. SMOKE DETECTION & ALARM	÷2 1	2		2
5. AUTOMATIC SPRINKLERS	0	÷2(0)B 0	(÷2)A 0	0
6. INTERIOR FINISH WITHIN LIVING UNITS	÷2 -1.5			-3
7. LIVING UNIT - BDRM DOORS & OPENINGS			0	0
8. EGRESS FROM LIVING UNIT(s)		-1		-1
9. SEPARATION OF LIVING UNITS FROM EACH OTHER & FROM COMMON SPACES	4	÷2 2	4	4
10. EXIT SYSTEM		-2	÷2 -1	-2
11. EXIT ACCESS		-1		-1
12. INTERIOR FINISH (egress routes)		-1		-1
13. VERTICAL OPENINGS	÷2 1	2	2	2
14. SMOKE CONTROL		0	0	0
TOTAL	S_1 = 7.5	S_2 = 3	S_3 = 7	S_4 = 4

NOTES:

A - Use full value if Safety Parameter 1 is based on 2-U, 3-U or 4-U construction. Divide by 2 (÷2) in all other cases.

B - Use (0) if operation of sprinkler system does not activate building fire alarm system.

Figure 33b. Mandatory Safety Requirements
Existing Multifamily and
Housing for the Elderly
> 6 story

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APPENDIX A
NBS DELPHI GROUP

Delphi Method

The Delphi technique was developed in the 1950's for the purpose of estimating the probable effects of atomic bombing attacks on the United States. Since then it has been applied to technological forecasting as well as in areas where judgmental information is required. The Delphi technique is basically concerned with the utilization of the combined knowledge of experts to arrive at a consensus opinion where factual information is incomplete.

The NBS exercise followed a process called Policy Delphi. The basic premise of the Policy Delphi is that it acts as a precursor to a committee activity. The Policy Delphi is not a substitute for research studies, analyses, or staff work. It is, however, an organized method for correlating views and information pertaining to a specific problem area and for allowing the respondents representing such views and information the opportunity to react to and assess differing viewpoints. Because the respondents are anonymous, fear of potential repercussions or embarrassment is removed and no simple individual need commit himself publicly to a particular view until after the alternatives have been put on the table.

Turoff in "The Policy Delphi"* analyzed committee and Delphi processes. The study points out that a Delphi followed by a committee provides good results in formulating policies.

The study identifies two major areas of problems with large size committees (i.e., communication and psychological). The communication difficulties are attributed to the diverse membership. The major lack of understanding tends to be between the following groups: individuals who are not familiar with many of the new decision aids coming out of operation research and system analyses but who have an intuitive feel for the complexities of the organization, and individuals who have been trained in many of modern management techniques and who are sometimes a little too confident that these approaches can be applied to every problem. The problems associated with operation of committees that tend to reflect psychological characteristics are:

- The domineering personality, or outspoken individual that takes over committee process.

- The unwillingness of individuals to take a position on an issue before all facts are in or before it is known which way the majority is headed.

*Murray Turoff, "The Design of a Policy Delphi", Technological Forecasting and Social Changes 2, No. 2 (1970).

- The difficulty of publicly contradicting individuals in higher positions.

- The unwillingness to abandon a position once it is publicly taken.

- The fear of bringing up uncertain ideas that may turn out to be idiotic and results in loss of face.

The above limitation may also apply to small size committees, except when the members of the small committee are given sufficient time to consider and explore the issue, and have assurance that the privacy of their respective remarks will be respected outside the committees. Under those conditions a small committee will not have any of the difficulties which have been identified for the large size committee.

Usually Delphi, whether it is to be conventional or computerized, undergoes four distinct phases. The first phase is characterized by exploration of the subject under discussion, wherein each individual contributes additional information he feels is pertinent to the issue. The second phase involves the process of reaching an understanding of how the group views the issue. If there is significant disagreement among members, the disagreement is explored in the third phase to bring out the underlying reasons for differences and possibly to evaluate them. The last phase, a final evaluation, occurs when all previously gathered information has been initially analyzed and the evaluations have been fed back for consideration.

There are two methods of gaining consensus: conventional and computerized. In the conventional form, a monitor team designs a questionnaire which is sent to a respondent group. After the questionnaire is returned, the monitor team summarizes the results, and based upon the results develops a revised questionnaire for the respondent group to answer. The respondent group is usually given at least one opportunity to revise its original answers after examing the group response.

The computerized method replaces the monitor group to a large degree with a computer which has been programmed to carry out the compilation of the respondent group results. This process has the advantage of eliminating delays in summarizing each round of Delphi, thereby turning the process into a real-time communication system. However, it does require that the information received from the respondents is in a form that can be fed into a computer and that an algorithm can be provided to analyze the data. The NBS Delphi Group used the conventional four-phase approach in its evaluation process.

Approach Used in Developing Fire Safety Parameters and Their Values

CFR Delphi Group

Fourteen individuals from the Fire Safety Engineering Division of the Center for Fire Research were chosen to act as a "Delphi" group. The experience of the group members in areas of fire/life safety ranged from six to thirty-five years. (Table A-1 identifies the group members.) Each individual was briefed about the general nature of the life safety risk analysis system and was given a detailed description of the safety model. The individuals were encouraged to seek more information about the system or any individual parameter, if the information given to them was insufficient. No guidance was provided as to the importance of any redundancy system or individual parameter.

Instructions for Completing of Forms

Each member of the Delphi Group was given five separate but identical forms, one for each of five fire safety functions: 1) General Fire Safety; 2) Fire Development; 3) Fire Containment; 4) Emergency Egress; and 5) Emergency Refuge. Delphi members were told the safety requirements should be considered only as they apply to multifamily housing. They were also instructed that the safety impact of each safety parameter should be established on its importance to a total facility safety basis. Each form had a clear statement of the specific safety function it should evaluate. General instructions for filing the questionnaire were:

1) Evaluate the relative worth of the safety requirement, (i.e. parameter) on each of the five fire safety functions, one function at a time, and record conclusions on the appropriate questionnaires.

2) Use numerical values to express the level of safety for each subdivision of each parameter.

3) The range of numerical values should not exceed (+10) for the highest level of safety of (-10) for the condition presenting the most severely hazardous condition. It is not necessary to use both (+10) and (-10). Such should occur only if the safety value of the most important safeguard exactly compensates the risk imposed by the most detrimental element. If this is not true the maximum safety value and maximum risk number should not be identical. Where the parameter's status neither improves safety nor creates a hazardous condition, a "zero" value should be assigned.

4) Add additional safety parameters to any of the questionnaires, if required to provide a more complete safety evaluation.

5) Increase the number of parameter subdivisions, if the number shown on the forms is insufficient.

6) Remarks may be made on each of the five forms.

Analysis of the Questionnaires

1. Forms. The completed forms were checked for completeness, illegible numbers and remarks. Where required, individuals were asked to provide additional information to complete the questionnaire. Figure A-2 shows the format agreed to by the Delphi group.

2. Preparation of Parameter Values. Each individual was requested to submit 350 values, which made the process of adjustments quite laborious. The values for each safety level were clustered to identify where major deviations occurred. An individual who supplied values significantly different from the cluster was asked for the reasoning behind his choice. Mostly the differences were generated by misinterpretations of the safety parameter functions. The values were then adjusted by the individuals and the process of preparing a consensus safety parameter table began.

3. Safety Parameter Table. Fourteen safety parameters were chosen to represent the most important areas of fire safety in multifamily buildings. The individual safety parameter values were adjusted using arithmetic means. All the values were expressed as whole numbers rounded off toward the "conservative" side.

4. Safety Parameter Selection for the Redundancy Systems. It is generally recognized that not all safety parameters are of equal importance in providing safety for a particular redundancy fire safety system. To identify those parameters which provide significant safety levels for each of the proposed redundancy systems the following method was used. For each redundancy system a set of three tables was generated. The first table had all the values of each parameter as assigned by the individual Delphi member. The second table was similar to the first, except numerical values were clustered in six ranks. The ranks are: High (10-8); Medium (7-4); Low (3-0); Negative Low (-1 to -3); Negative Medium (-4 to -7); and Negative High (-8 to -10). The third table ranked the safety parameters according to whether they provided high safety values or small safety values. Parameters with high safety values were included in the particular redundancy equation. The low value parameters were excluded from the equations because their ability to affect the total safety of a particular redundancy system was marginal. A number of safety parameters could not be evaluated by this system. The Delphi members could not agree on a general value for those safety parameters.

About one half of the members assigned high safety values to those parameters, where the other half assigned low safety values for the same parameters. Additional Delphi group query did not change their initial parameter values. To reflect the Delphi group split, the safety values of those parameters were divided by one-half.

The distribution of values assigned by Delphi members to two proposed redundancy systems, Fire Development and Fire Containment, were almost identical. Therefore, the Fire Development and the Fire Containment systems were combined to form a single redundancy system, Fire Control.

Fourteen safety parameters were included into the Fire Safety Evaluation System as providing significant life/fire safety support. Of those, four were assigned to all three redundancy systems (Hazardous Areas; Automatic Sprinklers; Separation of Living Units; and Vertical Openings). Five parameters were assigned to two redundancy systems (Fire Alarm; Smoke Detection; Exit System; Smoke Control; and Construction). The other fire safety parameters appear only once in the redundancy systems.

5. Delphi Group Status. The Delphi group finished its prime assignment to provide the basic system to be analyzed by the outside consultant group. The Delphi group also met several times after finishing this initial assignment, to consider adjustments or changes to the system suggested by the outside consultants or identified through NBS research. At each meeting the group analyzed the problem and suggested possible improvements to the system.

Table A-1

NBS Delphi Group

Benjamin, Irwin	Division Chief, Structural Engineer
Bright, Richard (Retired)	Sr. Fire Protection Engineer
Budnick, Edward	Program Head, Fire Protection Engineer
Bukowski, Richard	Acting Division Chief, Electrical Engineer
Cooper, Leonard	Fire Prevention Engineer
Custer, Richard (Retired)	Division Chief, Fire Protection Engineer
Gomberg, Al	Acting Program Head, Fire Protection Engineer
Gross, Daniel	Senior Mechanical Engineer
Lee, Bill	Fire Protection Engineer
Nelson, Harold	Program Head, Fire Protection Engineer
O'Neill, John	Fire Protection Engineer
Parker, William	Physicist
Peacock, Richard	Chemical Engineer
Vogel, Bertrum (Retired)	Structural Engineer

APPENDIX B

PEER GROUP

The Peer Group consisted of prominent persons in the regulation or specification of fire safety for multifamily housing. This included regulatory officials, code writing officials, fire safety consultants and architects representing a cross section of the applied field. The group membership is shown in Table B-1. The dates of meetings and attendance are shown in Table B-2.

Table B-1
CONSULTANT GROUP

Name	Affiliation	Representation
Austin, W.	HUD, Public Housing Architect	Regulatory
Belles, D.	Independent Consultant Fire Protection Engineer	NFPA Life Safety Code
Burgun, A.	Roger, Butler & Burgun	NFPA Life Safety Code
Prassas, M.	Independent Architect	American Institute of Architects (AIA)
Gangnes, A.	Independent Architect	Public
Gray, G.	Independent Architect	Public
Lynch, R.	Independent Consultant	Public
Moore, D.	HUD, Research Center	Regulatory
Roux, H.	Armstrong Cork Company	NFPA Life Safety Code
Sanders, J.	Fire Marshal State of Oklahoma	Code Enforcing
Summers, H.	Fire Marshal State of Virginia	Code Enforcing
Morehart, J.	Department HHS, Ofc. of Sec. Fire Safety Engineer	Regulatory

Table B-2
DATES OF MEETINGS AND ATTENDANCE

Meeting

January 31 - February 1, 1980
Washington, D.C.

Attendance

Belles, D.	Burgun, A.
Gangnes, A.	Lynch, R.
Gray, G.	Morehart, J.
Roux, H.	Sanders, J.
Moore, D.	

Meeting

June 11-12, 1980
Washington, D.C.

Attendance

Belles, D.	Burgun, A.
Gangnes, A.	Morehart, J.
Gray, G.	Lynch, R.
Roux, H.	Prassas, M.
Moore, D.	Sanders, J.

Meeting

September 8-9, 1981
Washington, D.C.

Attendance

Gangnes, A.	Morehart, J.
Gray, G.	Lynch, R.
Roux, H.	Prassas, M.
Moore, D.	Austin, W.
Burgun, A.	

Meeting

April 14-15, 1981
Washington, D.C.

Attendance

Belles, D.	Austin, W.
Gangnes, A.	Summers, H.
Gray, G.	Morehart, J.
Burgun, A.	Moore, D.
Prassas, M.	Sanders, J.

APPENDIX C

COMPUTER PROGRAM

Section A - Program Description

This computer program was developed to support the proof testing of the evaluation system. It is designed to be used in determining how best to upgrade a multi-family residence to an acceptable level of fire safety. The user inputs one or more values for each of the 14 safety parameters, each value being either the value of the corresponding parameter in the current state of the facility, or a "higher" value that would result from an upgrading of the facility. The program examines all possible combinations of input values of the 14 parameters, one value per parameter, and prints up to 1000 combinations that would upgrade the safety of the facility to or above the mandatory safety requirements if implemented.

If a given configuration of values for the 14 safety parameters yields a facility the safety of which is above the mandatory fire safety requirements, then any configuration in which some of the safety parameters are given "higher" values and in which no parameter values are decreased will also satisfy the requirements. For this reason, in any set of configurations the minimal configurations of parameter values that satisfy the mandatory safety requirements will be called "basic" solutions, and these are the only ones that the computer program will print. In the remainder of this discussion unless otherwise specified all solutions mentioned will be basic without explicitly calling attention to this fact.

The solutions, or successful combinations, may be sorted by one chosen parameter if the user wishes, in which case up to 1000 solutions may be printed for each value of the sorting parameter, with the precise number being user-determined. The special sorting feature provides the capability of analyzing building configurations which are limited to certain characteristics.

As presently written, the program searches for up to 1111 solutions for each specified value of the sorting routine, limiting the output for each value to at most the first 1000 solutions. A single change in input eliminates the sorting feature, causing all solutions to be grouped together and allowing a change in the <u>total</u> printed output to any number less than 1000 solutions. In all cases, a limit on the available combinations, or building configurations, may be accomplished by limiting the possible combinations of the parameters on input. The program is written in non-standard Fortran, and may not run on a particular machine unless minor modifications are made.

Section B - Input Format and Input-Related Errors

Subsection B-1 - Card Setup and Description

There are 19 cards in each set of data, and any number of sets may be run at one time. For sample input streams the reader should refer to Section F.

Card No.	Description	Format of Data on Card
1	Title - To appear at top of each page of output.	In columns 1-72. Any characters may be used.
2	Number of values for the parameter Construction, followed by the values. After the last one appears the number of the specified Construction values which correspond to unprotected situations.	Data may begin in any column, must be integer, and must be separated by blanks. A minus sign is used for negative numbers. No commas or decimal points are allowed. No character may appear in column 80. Any number of blanks can be used to separate the values and ascending order of the values is required.
3	Number of values for Hazardous Areas, followed by the values.	Same as for card 2.
4	Manual Fire Alarm	See card 2.
5	Smoke Detection and Alarm	See card 2.
6	Automatic Sprinklers	See card 2.
7	Interior Finish (within Living Units)	See card 2.
8	Living Unit - Bedroom Doors and Openings	See card 2.
9	Egress from Living Unit(s)	See card 2.
10	Separation of Living Units from Each Other and From Common Spaces	See card 2.
11	Exit System	See card 2.
12	Exit Access	See card 2.
13	Interior Finish (Egress Routes)	See card 2.
14	Vertical Openings	See card 2.
15	Smoke Control	See card 2.

Card No.	Description	Format of Data on Card
16	Minimum total Safety Values - Enter after multiplying by 10 the values from Table 3, depending on type of building and characteristics being examined. When the combinations are being examined by the program, those with any Table 2 sums less than the corresponding minimum total safety values will not be solutions.	See card 2.
17	Maximum Total Safety Values These serve to delimit the number of solutions. Each value must be greater than or equal to the corresponding minimum total safety value. When choosing a solution, the program will select only those combinations all of whose Table 2 sums are greater than or equal to their corresponding minimum total safety values, but such that not all the sums are greater than their corresponding maximum total safety values.	See card 2.
18	Number of Printed Solutions Desired - Will be the total number of solutions printed if sorting feature not used, or will be the number of solutions printed per each value of the sorting parameter if the sort feature is used. If greater than 1000 it will be changed to 1000.	See card 2.
19	Number of the Sorting Parameter - 1-14 if the sort routine is desired, 0 if not. If the sort is used solutions will be grouped into clusters. Each member of a cluster will have the same number for the sorting parameter, this value being higher than the one the sort parameter had in the last cluster. Sometimes the sort parameter is called the parameter under analysis.	See card 2.

Section C - Program Output

The program output has two main formats. One format is generated when the user does not wish to use the sort feature, with the solutions appearing in one group. The other is used when the sort feature is specified, and the solutions appear grouped by ascending values of the sort parameter. The two formats and their differences will be illustrated by the output Examples 1 and 2 in Section G. The unsorted format will now be discussed, then the ways in which the sorted output differs from it.

The reader should now examine the output of Example 1. The first output page shows all of the input with the exception of the number of printed solutions desired. At the top of the page appears the desired title, followed by the parameters which are given only one input value and the values of each. If there are no parameters that are held constant the word "none" appears under the heading. Following are the parameters which have more than one input value and the values which are used. Construction is treated specially, with a "u" written after values which correspond to unprotected situations. Below the safety parameter values on the page are written the specified minimum and maximum total safety values.

The printed solutions appear next. The number on the extreme left under the heading "SOL#" is the solution number corresponding to the successful combination on the right. One may observe that the columns under the heading "cases" are blank for all 32 solutions, indicating that no solution printed satisfied a special case. The special cases and corresponding flags will be discussed in the next section on sorting routine output since there are many special situations shown in the second example. To the right of the solution number and cases columns appear the values of the safety parameters in the successful combinations, under headings which are abbreviated forms of the parameter names. Parameters which are held constant do not appear here, since their values are the same for each solution, and the reader is reminded that these constant values are an integral part of the combinations, especially in computing the four total safety sums. These four sums appear to the right of the nonconstant parameter values, and are computed from the combinations using Table 2 after its entries are multiplied by 10.

The solutions are printed until either all solutions have been exhausted or the specified print limit has been reached, with the title appearing at the top of each page. At the end of the output a message is written in one of three forms:

XXXXX COMBINATIONS HAVE BEEN FOUND.

or XXXXX COMBINATIONS HAVE BEEN FOUND. FIRST XXXXX HAVE BEEN PRINTED.

or MORE THAN 1111 COMBINATIONS HAVE BEEN FOUND. FIRST XXXXX HAVE BEEN PRINTED.

These messages appear at the top of the page following the one on which the last output appeared. When the number of solutions is less than or equal to the number of printed solutions desired, the first message is written. Otherwise not all solutions are printed, and one of the other two messages appears.

The reader should now refer to example 2, in which the sorting routine is used, and parameter number 7 (Living Unit Bedroom) is chosen as the sort parameter. The first page of output is identical to example 1 except that a message flagging the sorting parameter and its values has been added at the bottom.

If one examines the entire output, taking account of the headings at the top of each page, one notices how the solutions are grouped by ascending values of the sorting parameter. Each group has a format almost identical to the total solution output of the unsorted case, with one exception, the heading between the title and the column headings. Also it may be seen that for the combinations using the first value of the sort parameter the special heading begins with the word "combinations" while for the combinations in the other groups it begins with "new combinations". This is because solutions which are successful with a certain value of the sort parameter will always be successful with a higher value of the parameter, and hence in such a situation the later "duplicate" solution is suppressed. Another fact to note is that the parameter being examined does not appear in the listing of solution parameter values; in effect it is treated as a constant parameter within each grouping.

In example 2 it can be seen that many of the solutions are flagged to the right of the solution number under the "cases" heading. These flags, the letters A-D, of which only A and B appear here, indicate the special cases that can occur. They are listed at the bottom of Table 1.

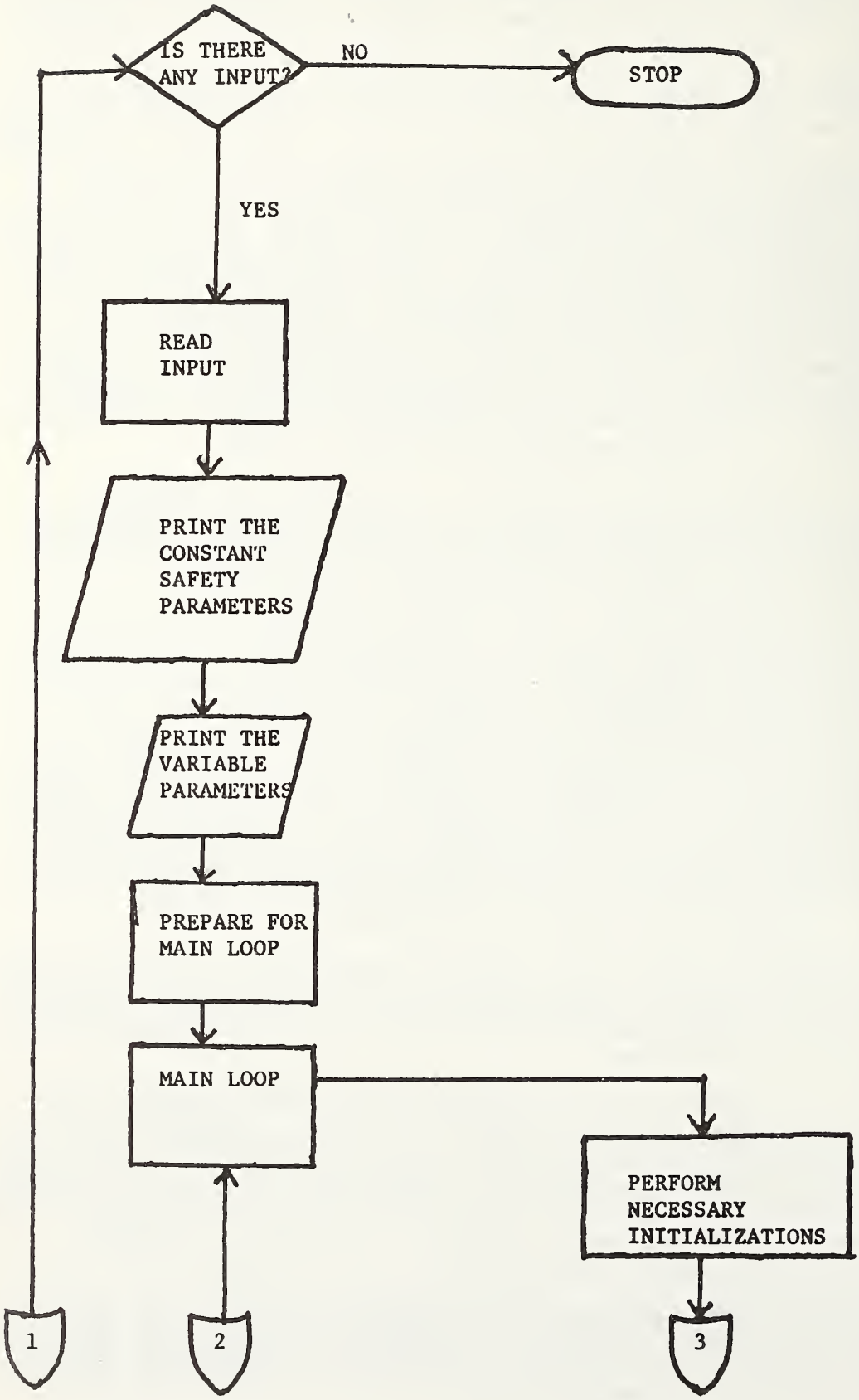
If a solution fulfilled special case A it would be flagged by an A in the column under the C in "Cases". If it satisfied case B it would have a B under the A in "Cases", and so on, the flag for each case being incremented in both value and column. The reason the flags need to be in distinct columns may be graphically observed in solutions 5 through 7, of example 2, which fulfill more than one special case simultaneously. In those solutions which are flagged it is usually possible to discern one or more parameter values to the right of which an asterisk appears. This is a flag indicating that the flagged parameter value is adjusted because of the special case. It does not always appear because the parameter the value of which is modified may be a constant parameter or the sort parameter, in which case its value is not printed.

Finally, if in the non-sort case no solutions were found, or if in the sort-specified case no solutions were located for a particular value of the sort parameter, a message appears indicating that there are no combinations which satisfy the conditions.

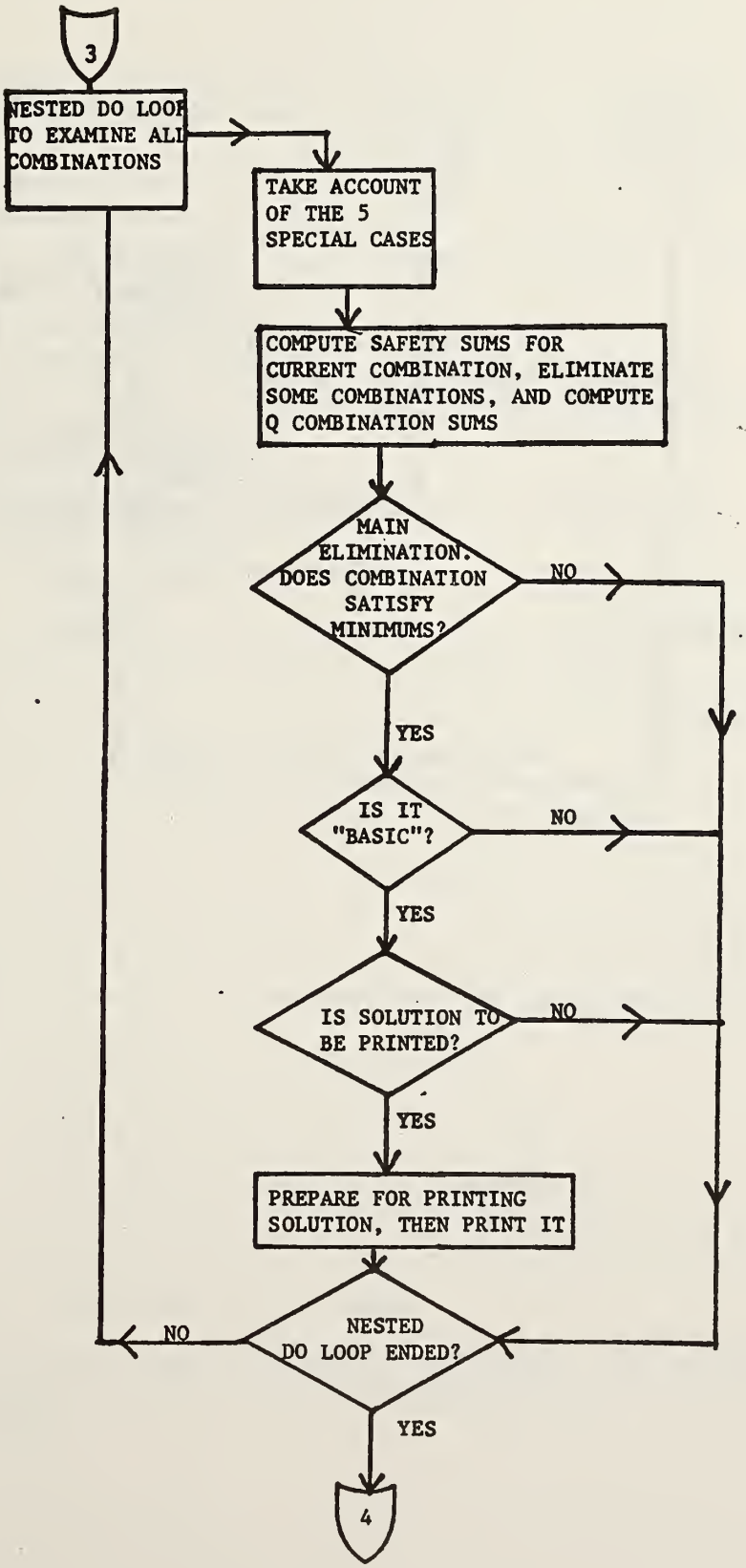
The equivalency testing program is supplied with internal comments, and therefore the programmer should have at his disposal a copy of the source listing. Information on the inputs and outputs of the program is contained in this report. Together, these two sources supply almost all the guidance any programmer would need to understand and, if necessary, modify the existing code. This programmer's guide is therefore very general and does not dwell on each minute point of the program.

Section D consists of a flowchart. Section E is a listing of the main variables used and their functions. A listing of the program is included in Section F, while Section G consists of the input card images for Examples 1 and 2, followed by the example outputs.

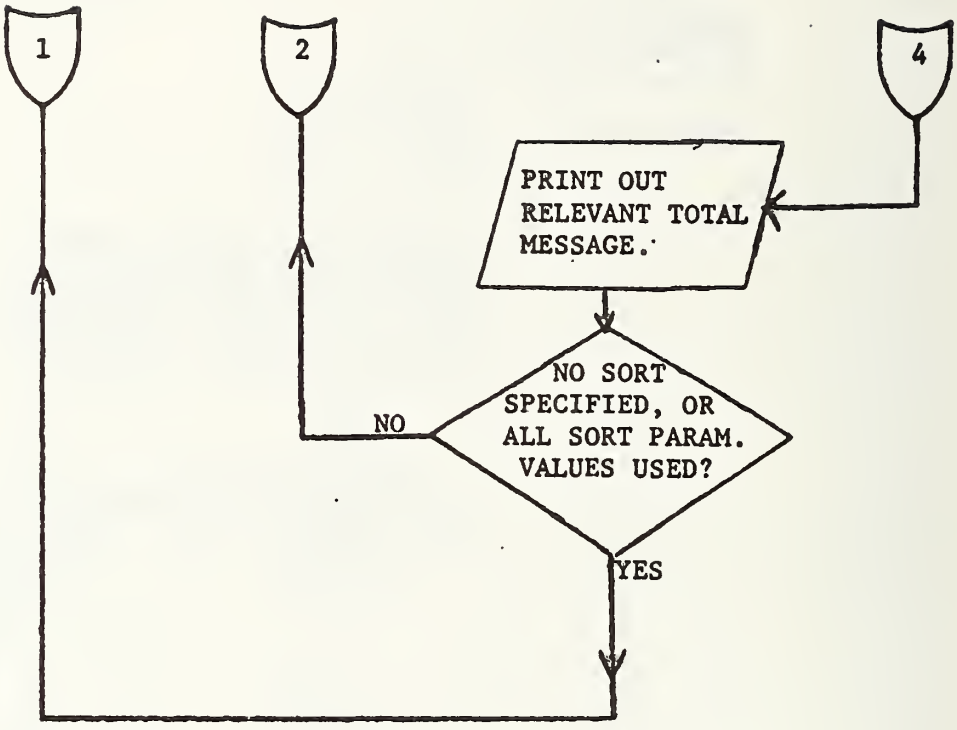
SECTION D - FLOWCHART



FLOWCHART - PART 2



FLOWCHART - PART 3



Section E - Main Variables of the Program

1. ALTER - An indicator that the last combination to be checked satisfied a special case.

2. BLANK - A variable containing a blank which is used for various purposes.

3. BLC - The number of values the sort parameter is given on input.

4. BLN - The sort parameter number.

5. CHANGE - An array of pointers to the nonconstant parameters. If CHANGE (1) = 5, the fifth parameter is the first nonconstant one, to give an example.

6. CONDS - Print flags indicating the special case numbers 1-5.

7. CT - Number of nonconstant parameters.

8. CUR - The current values in main loop of the 14 safety parameters, initialized as cur(1) = P(1,I1), cur(2) = P(2,I2), . . .

9. CYCLES - Number of solutions found in all if no sort is specified, or for the current sort parameter value.

10. FLAG - Used in most situations where a flag is required.

11. I - I(1) is equivalent to I1, I(2) is equivalent to I2, etc.

12. ICOUNT - Number of solutions printed for each solution grouping.

13. I1-I14 - Used to reference parameters 1-14 in the arrays P and Q.

14. J - J(1) is equivalent to J1, J(2) to J2, etc.

15. J1-J14 - The number of values of parameters 1-14.

16. KT - Number of the current execution of the main loop.

17. LAST - The value of the sort parameter during the last loop pass.

18. LINES - Lines written so far on a page.

19. LINESP - The number of the solution to be printed. For example, if LINESP = 500, the solution to be output will be the 500th printed.

20. NMAX - Desired number of printed solutions for each grouping. Must be less than or equal to 1000.

21. NAØ - Variable changed from Ø to 1 if some of conditions in note A which cause a safety parameter value to be changed are satisfied for last value of the sort parameter.

22. NA2 (NA9) - Variable changed for Ø to 1 if conditions in note A causing modification of safety parameter 2 (9) are satisfied for last value of sort parameter.

23. NEWT - Parameter to record test result for current values of safety parameters to see whether or not configuration is dominated by a solution previously obtained.

24. NTA (NTB, NTC, NTD) - Variable changed from Ø to 1 if conditions in note A (B,C,D) which cause modification of a safety parameter value are satisfied.

25. P - Array containing the parameter values and the current value of the sort parameter. The first row contains the first parameter's values, etc.

26. PFLAGS - Asterisks placed next to paramater values that will be zeroed out due to special cases.

27. PN - Array containing the names of cards 2-18.

28. Q - Same as P except that the last value of the sort parameter is used.

29. R - Used in printing out the solutions and their safety sums.

30. SOLS - Array into which the values of configurations of safety parameters that are solutions are read and maintained for subsequent reference.

31. SUMA - General safety computed for the current combination.

32. SUMA1 - Same as SUMA but uses the last value of the sort parameter.

33. SUMB - Containment safety computed for the current combination.

34. SUMB1 - Same as SUMB but uses the last sort parameter value.

35. SUMC - Extinguishment safety of the current combination.

36. SUMC1 - Same as SUMC but using the last sort parameter value.

37. SUMD - People movement safety of the current combination.

38. SUMD1 - Same as SUMD but using last sort parameter value.

39. TI - Column headings of the parameter values of the solutions.

40. TITLE - Array containing the title to be placed on each page.

41. TJ - Column headings used in the actual printing of the solutions.

42. U - Contains the character "U" for flagging unprotected values.

43. UNPROT - The number of unprotected construction values.

44. X - Array, the minimum requirements read in.

45. XM - Array, the maximum requirements read in.

```
SHIBE*RESID(1),QQRESID(27)
      C     RESID,QQRESID
      C
      C        THE IMPLICIT STATEMENT BELOW  CAUSES ALL VARIABLES OF
      C        THE PROGRAM TO BE TYPED AS INTEGER. SINCE NO OTHER TYPE
      C        STATEMENTS APPEAR.
      C
            IMPLICIT INTEGER (A-Z)
      C
      C        DIMENSION THE ARRAYS REQUIRED IN THE PROGRAM.
      C
            DIMENSION TITLE(18),TI(28,2),TJ(36,2),I(14),CHANGE(14),PN(14,8),
           2          J(14),P(14,8),Q(14,8),X(4),XM(4),R(18),PFLAGS(14),
           3          CONDS(5),PNUMB(14),PNUMB2(14)
           4          ,CUR(14),SOLS(1111,14)
      C
      C        THE STATEMENT THAT FOLLOWS CAUSES J1 TO REFER TO THE SAME
      C        STORAGE AREA AS J(1), AND SIMILARLY FOR J2 (J(2)) THRU J14
      C        (J(14)).  THE SAME ACTION IS DONE FOR I1 (I(1)) TO I14
      C        (I(14)). WHENEVER A LOOP STRUCTURE COULD BE FACILITATED
      C        WITH THE ARRAY NOTATION, SUCH NOTATION IS USED, OTHERWISE
      C        IT IS NOT.
      C
            EQUIVALENCE  (J1,J(1)),(J2,J(2)),(J3,J(3)),(J4,J(4)),
           2             (J5,J(5)),(J6,J(6)),(J7,J(7)),(J8,J(8)),
           3             (J9,J(9)),(J10,J(10)),(J11,J(11)),(J12,J(12)),
           4             (J13,J(13)),(J14,J(14)),
           5             (I1,I(1)),(I2,I(2)),(I3,I(3)),
           6             (I4,I(4)),(I5,I(5)),(I6,I(6)),(I7,I(7)),
           7             (I8,I(8)),(I9,I(9)),(I10,I(10)),(I11,I(11)),
           8             (I12,I(12)),(I13,I(13)),(I14,I(14))
      C
      C        THE 2 DIMENSIONAL ARRAY TI CONTAINS THE HEADINGS PRINTED
      C        ABOVE THE PARAMETER VALUES OF THE SUCCESSFUL COMBINATIONS.
      C        TWO CONSECUTIVE PIECES ARE USED FOR ONE HEADING, SINCE
      C        A HEADING MAY BE UP TO SIX LETTERS LONG.  THE FIRST COLUMN
      C        HOLDS THE FIRST ROW OF THE PARAMETER HEADINGS, THE SECOND
      C        COLUMN HOLDS THE SECOND ROW.  PRINTING IS NEVER ACTUALLY
      C        DONE FROM THE TI ARRAY. INSTEAD, HEADINGS OF NONCONSTANT
      C        PARAMETERS ARE MOVED TO TJ AND THE PRINTING TAKES PLACE
      C        FROM THERE.
      C
            DATA (TI(K,1),K=1,28) /'CON','ST ','HAZ','AR ','MAN',
           2'U. ','SMO','KE ','AUT','OM ','FIN','SH ',' UN','IT ','EGR','SS ',
           2'SEP','AR ',' EX','IT ',' EX','IT ','FIN','SH ',' VE',
           2'RT ','SMO','KE '/
            DATA (TI(K,2),K=1,28) /'   ','   ','ARE','AS ','ALA',
           2'RM ','DET','EC ','SPR','IN ','UNI','TS ','BED','RM ','UNI','TS ',
           2'UNI','TS ','QUA','LT ','ACC','SS ','EGR','SS ',' OP',
           2'EN','CNT','RL '/
            DATA (PNUMB(K),K=1,14) /'P#01','P#02','P#03','P#04','P#05',
           2'P#06','P#07','P#08','P#09','P#10','P#11','P#12','P#13','P#14'/
      C
      C        TJ NEED ONLY BE INITIALIZED TO THE SAFETY SUM HEADINGS OF
      C        THE SOLUTIONS, SINCE THE OTHER HEADINGS ARE MOVED
      C        IN FROM TI.
      C
            DATA (TJ(K,1),K=29,36) /'FIR','E  ','EGR','SS ','REF',
           2'UG ','GEN',' RL '/
```

```
     2'UG ','GEN','RL '/
      DATA (TJ(K,2),K=29,36) /'CNT','RL ',' PR','OV ',' PR',
     2'OV',' SA','F. '/
C
C        PN IS THE 2 DIMENSIONAL ARRAY CONTAINING THE NAMES OF INPUT
C        CARDS 2-15. IT IS USED BY THE SUBROUTINE EDIT FOR POSSIBLE
C        ERROR MESSAGES. AND BY THE MAIN PROGRAM WHENEVER THE NAME
C        OF A SAFETY PARAMETER MUST BE PRINTED.
C
      DATA (PN(1,K),K=1,8) /'CONS','TRUC','TION',5*' '/
      DATA (PN(2,K),K=1,8) /'HAZA','RDOU','S AR','EAS',4*' '/
      DATA (PN(3,K),K=1,8) /'MANU','AL F','IRE ','ALAR','M',3*' '/
      DATA (PN(4,K),K=1,8) /'SMOK','E DE','TECT','ION ','AND ','ALAR',
     2'M',' '/
      DATA (PN(5,K),K=1,8) /'AUTO','MATI','C SP','RINK','LERS',3*' '/
      DATA (PN(6,K),K=1,8) /'INTE','RIOR',' FIN','ISH ','IN L','IVIN',
     2'G UN','ITS'/
      DATA (PN(7,K),K=1,8) /'LIVI','NG U','NIT ','BEDR','OOM(','DRS/',
     2'OPEN','NGS)'/
      DATA (PN(8,K),K=1,8) /'EGRE','SS F','ROM ','LIVI','NG U','NITS',
     22*'   '/
      DATA (PN(9,K),K=1,8) /'SEPA','RATI','ON O','F LI','VING',' UNI',
     2'TS','    '/
      DATA (PN(10,K),K=1,8) /'EXIT',' QUA','LITY',5*' '/
      DATA (PN(11,K),K=1,8) /'EXIT',' ACC','ESS',5*'   '/
      DATA (PN(12,K),K=1,8) /'INTE','RIOR',' FIN','ISH','(EGR','ESS ',
     2'ROUT','ES)'/
      DATA (PN(13,K),K=1,8) /'VERT','ICAL',' OPE','NING','S',3*'   '/
      DATA (PN(14,K),K=1,8) /'SMOK','E CO','NTRO','L',4*' '/
C
C        INITIALIZE ALTER, CONDS, AND PFLAGS TO VALUES CORRESPONDING
C        TO NO SPECIAL CASE.
C
      DATA ALTER /0/
      DATA (CONDS(K),K=1,5) /5*' '/
      DATA (PFLAGS(K),K=1,14) /14*' '/
C
C
C
C
C
C
C
C
C
C        SET THE BEGINNING OF PRINT TO THE TOP OF A PAGE
C        AND READ IN THE TITLE.
C
10    WRITE (6,410)
      READ (5,420,END=400) (TITLE(K),K=1,18)
C
      READ (5,424) J1,(P(1,K),K=1,J1),UNPROT
      READ (5,424) J2,(P(2,K),K=1,J2)
      READ (5,424) J3,(P(3,K),K=1,J3)
      READ (5,424) J4,(P(4,K),K=1,J4)
      READ (5,424) J5,(P(5,K),K=1,J5)
      READ (5,424) J6,(P(6,K),K=1,J6)
      READ (5,424) J7,(P(7,K),K=1,J7)
      READ (5,424) J8,(P(8,K),K=1,J8)
```

```
      READ (5,424) J9,(P(9,K),K=1,J9)
      READ (5,424) J10,(P(10,K),K=1,J10)
      READ (5,424) J11,(P(11,K),K=1,J11)
      READ (5,424) J12,(P(12,K),K=1,J12)
      READ (5,424) J13,(P(13,K),K=1,J13)
      READ (5,424) J14,(P(14,K),K=1,J14)
      READ (5,424) X(1),X(2),X(3),X(4)
      READ (5,424) XM(1),XM(2),XM(3),XM(4)
      READ (5,424) NMAX
      READ (5,424) BLN
C
15    IF (NMAX.GT.1000) NMAX=1000
C
C        INITIALIZE THE VARIABLE BLANK AND SET THE ARRAY
C        Q EQUAL TO P.
C
      BLANK=' '
      DO 20 K=1,14
      DO 20 KK=1,8
20    Q(K,KK)=P(K,KK)
C
C        WRITE OUT THE TITLE AT THE TOP OF THE FIRST
C        PAGE OF OUTPUT AND THEN OUTPUT THOSE PARAMETERS
C        WHICH ARE GIVEN ONLY ONE INPUT VALUE. THE
C        PARAMETER CONSTRUCTION, THE FIRST ONE, IS
C        TREATED SPECIALLY IN ORDER TO PLACE A 'U' AFTER
C        UNPROTECTED CASES. ALSO, IF NO PARAMETERS ARE
C        CONSTANT, 'NONE' IS PRINTED OUT.
C
      WRITE (6,530) (TITLE(K),K=1,18)
      WRITE (6,430)
      WRITE (6,440)
      WRITE (6,450)
      FLAG=0
      IF (.NOT.(J(1).EQ.1.AND.UNPROT.GT.0)) GO TO 30
      U='U'
      FLAG=1
      WRITE (6,480) (PN(1,K),K=1,8),P(1,1),U
30    IF (.NOT.(J(1).EQ.1.AND.UNPROT.EQ.0)) GO TO 40
      FLAG=1
      WRITE (6,460) (PN(1,K),K=1,8),P(1,1)
40    DO 50 ITER=2,14
      IF (J(ITER).NE.1) GO TO 50
      FLAG=1
      WRITE (6,460) (PN(ITER,K),K=1,8),P(ITER,1)
50    CONTINUE
      IF (FLAG.EQ.0) WRITE (6,470)
C
C        NOW PRINT OUT THE PARAMETERS WHICH WERE GIVEN MORE
C        THAN 1 INPUT VALUE, AS WELL AS THE VALUES THEMSELVES.
C        AGAIN, TREAT THE CONSTRUCTION PARAMETER SPECIALLY TO
C        FLAG UNPROTECTED CASES.
C
      WRITE (6,430)
      WRITE (6,490)
      WRITE (6,450)
      IF (.NOT.(J(1).GT.1.AND.UNPROT.GT.0)) GO TO 60
      U='U'
```

```
      L=J(1)
      M=UNPROT+1
      IF (UNPROT.EQ.L) WRITE (6,480) (PN(1,K),K=1,8),(P(1,K),U,K=1,L)
      IF (UNPROT.LT.L) WRITE (6,480) (PN(1,K),K=1,8),(P(1,K),U,K=1,UNPRO
     2T),(P(1,K),BLANK,K=M,L)
60    IF (.NOT.(J(1).GT.1.AND.UNPROT.EQ.0)) GO TO 70
      L=J(1)
      WRITE (6,460) (PN(1,K),K=1,8),(P(1,K),K=1,L)
70    DO 80 ITER=2,14
      IF (J(ITER).LE.1) GO TO 80
      L=J(ITER)
      WRITE (6,460) (PN(ITER,K),K=1,8),(P(ITER,K),K=1,L)
80    CONTINUE
C
C        PRINT THE MINIMUM AND MAXIMUM TOTAL SAFETY
C        REQUIREMENTS.
C
      WRITE (6,430)
      WRITE (6,510) X(1),XM(1),X(2),XM(2),X(3),XM(3),X(4),XM(4)
      WRITE (6,430)
C
C        IF BLN IS IN THE RANGE 1-14 SET BLC EQUAL TO J(BLN),
C        HAS, THEN SET J(BLN) TO 1 (SINCE THE PROGRAM
C        THE NUMBER OF VALUES THE SPECIFIED SORT PARAMETER
C        LOOKS AT THE SORT PARAMETER 1 VALUE AT A TIME),
C        CHOSEN PARAMETER. IF BLN=0, THE SORT FEATURE IS
C        AND PRINT OUT THE NAME AND ALL VALUES OF THE
C        NOT DESIRED AND CONTROL BRANCHES AROUND THE
C        PROGRAM ACTIONS MENTIONED ABOVE. IF BLN IS
C        NOT BETWEEN 0 AND 14 A MESSAGE IS WRITTEN AND
C        EXECUTION STOPS.
C
      FLAG=0
      DO 90 ITER=1,14
      IF (BLN.EQ.ITER) FLAG=1
90    CONTINUE
      IF (FLAG.EQ.1) GO TO 100
      IF (BLN.EQ.0) GO TO 110
      WRITE (6,520) BLN
      STOP
100   BLC=J(BLN)
      WRITE (6,500) (PN(BLN,K),K=1,8),(P(BLN,K),K=1,BLC)
      J(BLN)=1
C
C
C
C
C
C
C
C        NOW FIND ALL THE NONCONSTANT SAFETY PARAMETERS IN ORDER
C        TO FORM THE PARAMETER NAME HEADINGS IN THE OUTPUT AND
C        TO INITIALIZE THE CHANGE ARRAY. CT, THE NUMBER OF NON-
C        CONSTANT PARAMETERS, IS ALSO CALCULATED. THE RATIONALE
C        FOR THESE EVENTS IS AS FOLLOWS. ONLY THOSE PARAMETERS
C        IN THE PRINTED SOLUTIONS, THE CONSTANT PARAMETERS AND
C        WHICH WERE GIVEN MORE THAN ONE VALUE ON INPUT APPEAR
C        PARAMETER UNDER ANALYSIS (SINCE J(BLN) NOW = 1) DO
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```
C        NOT APPEAR. THE HEADINGS OF THE NONCONSTANT TERMS MUST
C        THEREFORE BE SET UP, AS WELL AS AN ARRAY (CHANGE) WHICH
C        CONTAINS POINTERS TO THE NONCONSTANT PARAMS.
C        ON EXIT FROM THE NESTED LOOP, CT MUST BE DECREMENTED
C        BY ONE TO BE CORRECT, AND THEN TWOCT=2*CT IS
C        COMPUTED FOR LATER USE IN PRINTING OUT THE
C        PARAMETER HEADINGS.
C
C
110   CT=1
      DO 130 ITER=1,14
      IF (J(ITER).LE.1) GO TO 130
      DO 120 K1=1,2
      TJ(2*CT-1,K1)=TI(2*ITER-1,K1)
120   TJ(2*CT,K1)=TI(2*ITER,K1)
      CHANGE(CT)=ITER
      PNUMB2(CT)=PNUMB(ITER)
      CT=CT+1
130   CONTINUE
      CT=CT-1
      TWOCT=2*CT
C
C
      DO 132 K=1,14
      DO 132 KK=1,8
      P(K,KK)=P(K,KK)*10
132   Q(K,KK)=Q(K,KK)*10
C
C
C
C        THE SECTION ABOVE PERFORMED SOME OF THE INITIALIZATION
C        NEEDED IN PREPARATION FOR THE MAIN LOOP OF THE
C        PROGRAM, NOW THE REST IS PERFORMED. LINESP,
C        THE SOLUTION NUMBER TO BE PLACED TO THE LEFT OF
C        EACH SOLUTION, IS SET TO 1, AS IS KT, THE LOOP
C        COUNTER. KT = 1 FOR THE FIRST EXECUTION OF THE LOOP,
C        2 FOR THE SECOND, ETC.
C
      LINESP=1
      KT=1
C
C
C
C
C
C
C
C
C
C
C        NOW BEGINS THE MAIN LOOP OF THE PROGRAM. THE LOOP
C        IS ONLY EXECUTED ONCE IF THE SORT PARAMETER SPECIFIED
C        IS 0, OTHERWISE THE LOOP IS PERFORMED ONCE FOR EACH
C        INPUT VALUE OF THE SORT PARAMETER. EACH EXECUTION
C        FINDS THOSE SOLUTIONS WHICH SATISFY THE MINIMUM AND
C        MAXIMUM REQUIREMENTS USING THE CURRENT VALUE OF
C        THE SORT PARAMETER, UNLESS BLN=0, IN WHICH CASE
C        ALL COMBINATIONS OF EACH PARAMETER ARE TESTED AGAINST
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C        THE REQUIREMENTS. ON ANY LOOP PASS BUT THE FIRST
C        PLACE THE LAST VALUE OF THE SORT PARAMETER INTO
C        THE ARRAY Q. Q IS IDENTICAL TO P EXCEPT THAT IT
C        CONTAINS THE SORT PARAMETER'S LAST VALUE AND IS USED
C        TO ELIMINATE SOLUTIONS WHICH WERE FOUND IN THE
C        LAST LOOP PASS, SINCE SUCH A SOLUTION USING THE
C        CURRENT  VALUE OF THE SORT PARAMETER INSTEAD
C        OF THE LOWER VALUE OF THE LAST LOOP PASS WILL
C        ALWAYS BE A CURRENT SOLUTION.
C
140   IF (KT.NE.1) Q(BLN,1)=LAST
C
C
C
C             PERFORM THE INITIALIZATIONS NECESSARY FOR EACH LOOP
C             PASS OF THE MAIN LOOP. FIRST RESET THE COUNTER OF
C             SOLUTIONS FOUND TO 0, THEN RESET THE COUNTER OF
C             SOLUTIONS PRINTED. LINES, THE VARIABLE WHICH COUNTS
C             HOW MANY LINES HAVE BEEN PRINTED ON THE CURRENT
C             PAGE, IS SET INITIALLY TO 57 SO THAT HEADINGS WILL
C             APPEAR BEFORE THE FIRST OUTPUT OF THE CURRENT
C             LOOP PASS. THE INDICATOR FLAG IS USED TO DETERMINE
C             WHICH OF THE THREE POSSIBLE TOTAL MESSAGES
C             APPEAR AT THE END OF THE CURRENT PASS.
C
      CYCLES=0
      ICOUNT=0
      LINES=57
      FLAG=0
      IF (BLN.NE.0) DIV=P(BLN,1)/10
C
C             THE NESTED LOOP BELOW FINDS THE SOLUTIONS IN THE
C             CURRENT LOOP PASS. THE VARIABLE I1 IS USED TO REFERENCE
C             THE FIRST PARAMETER'S VALUES IN THE ARRAY P OR Q. A REF.
C             WOULD BE OF THE FORM P(1,I1), INDICATING THE I1ST VALUE
C             OF THE FIRST PARAMETER. I2 IS USED TO REFERENCE THE
C             SECOND PARAMETER IN THE SAME WAY, AND SO ON FOR I3-I14.
C             ALSO, I1 MAY VARY FROM 1 TO THE NUMBER OF VALUES THE
C             FIRST PARAMETER WAS GIVEN (J1), AND SIMILARLY FOR
C             I2-I14. THE SORT PARAMETER IS HANDLED SPECIALLY. J(BLN)
C             WAS ALREADY SET TO 1, AND THEREFORE I(BLN) IS 1
C             DURING ANY PARTICULAR LOOP PASS. IT FOLLOWS THAT
C             P(BLN,1) IS THE ONLY VALUE OF THE SORT PARAMETER
C             REFERRED TO IN THE NESTED LOOP, AND IT MUST BE CHANGED
C             BEFORE THE NEXT LOOP PASS TO THE SUCCEEDING VALUE OF THE
C             SORT PARAM. I1-I14 ARE USED IN EXACTLY THE SAME WAY IN
C             REFERENCING THE ARRAY Q, BUT Q DIFFERS FROM P IN THAT
C             Q(BLN,1) IS THE LAST VALUE OF THE SORT PARAMETER.
C
      DO 350 N1=1,J1
      DO 350 N2=1,J2
      DO 350 N3=1,J3
      DO 350 N4=1,J4
      DO 350 N5=1,J5
      DO 350 N6=1,J6
      DO 350 N7=1,J7
      DO 350 N8=1,J8
      DO 350 N9=1,J9
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      DO 350 N10=1,J10
      DO 350 N11=1,J11
      DO 350 N12=1,J12
      DO 350 N13=1,J13
      DO 350 N14=1,J14
      I1=N1
      I2=N2
      I3=N3
      I4=N4
      I5=N5
      I6=N6
      I7=N7
      I8=N8
      I9=N9
      I10=N10
      I11=N11
      I12=N12
      I13=N13
      I14=N14
C
      DO 160 ITER=1,14
  160 PFLAGS(ITER)=' '
      DO 170 ITER=1,4
  170 CONDS(ITER)=' '
      NTA=0
      NTB=0
      NTC=0
      NTD=0
      IF (BLN.EQ.0) GO TO 175
      I(BLN)=KT
  175 CONTINUE
      IF (UNPROT.GE.I1.AND.P(5,I5).LT.60.AND.
     2 (P(2,I2).EQ.-40.OR.P(9,I9).GE.0)) NTA=1
      IF (UNPROT.GE.I1.AND.(P(5,I5).EQ.20.OR.P(5,I5).EQ.40)) NTB=1
      IF (UNPROT.GE.I1.AND.P(13,I13).EQ.20) NTC=1
      IF (P(10,I10).EQ.-60.AND.P(11,I11).EQ.-60) NTD=1
      IF (NTA.EQ.0) GO TO 180
      CONDS(1)='A'
      IF (P(2,I2).EQ.-40) PFLAGS(2)='*'
      IF (P(9,I9).GE.0) PFLAGS(9)='*'
  160 IF (NTB.EQ.0) GO TO 190
      CONDS(2)='B'
      PFLAGS(5)='*'
  190 IF (NTC.EQ.0) GO TO 200
      CONDS(3)='C'
      PFLAGS(13)='*'
  200 IF (NTD.EQ.0) GO TO 210
      CONDS(4)='D'
      PFLAGS(11)='*'
  210 CONTINUE
C
      CUR(1)=P(1,I1)
      CUR(2)=P(2,I2)
      CUR(3)=P(3,I3)
      CUR(4)=P(4,I4)
      CUR(5)=P(5,I5)
      CUR(6)=P(6,I6)
      CUR(7)=P(7,I7)
```

```
      CUR(8)=P(8,I8)
      CUR(9)=P(9,I9)
      CUR(10)=P(10,I10)
      CUR(11)=P(11,I11)
      CUR(12)=P(12,I12)
      CUR(13)=P(13,I13)
      CUR(14)=P(14,I14)
C
C           THE TABLE 5 SUMS ARE COMPUTED FOR THE COMBINATION CURRENTLY
C           BEING EXAMINED. AND IF THIS IS NOT THE FIRST LOOP PASS,
C           THE SAME FUNCTION IS PERFORMED ON THE COMBINATION
C           IDENTICAL TO THE PRESENT ONE BUT USING THE LAST VALUE
C           OF THE SORT PARAMETER.  SUMA CORRESPONDS TO GENERAL SAFETY,
C           SUM8 TO CONTAINMENT SAFETY, SUMC TO EXTINGUISHMENT
C           SAFETY, AND SUMD TO PEOPLE MOVEMENT SAFETY. A 1 IS TACKED
C           ON TO THE VARIABLE NAMES FOR THE CORRESPONDING Q SUMS.
C           THERE ARE 3 IF STATEMENTS THAT HELP TO ELIMINATE
C           COMBINATIONS AT THIS POINT THAT DO NOT FULFILL THE
C           REQUIREMENTS.
C
      IF (NTA.EQ.1.AND.PFLAGS(2).EQ.'*') CUR(2)=-70
      IF (NTA.EQ.1.AND.PFLAGS(9).EQ.'*') CUR(9)=-20
      IF (NT8.EQ.1) CUR(5)=0
      IF (NTC.EQ.1) CUR(13)=0
      IF (NTD.EQ.1) CUR(11)=0
      SUMA=(CUR(3)+CUR(4)+CUR(6)+CUR(13))/2+CUR(1)+
     2 CUR(2)+CUR(5)+CUR(9)
      IF (SUMA.LT.X(1)) GO TO 340
      SUM8=(CUR(2)+CUR(5)+CUR(9))/2+CUR(3)+CUR(4)+
     2 CUR(8)+CUR(10)+CUR(11)+CUR(12)+CUR(13)+CUR(14)
      SUMC=(CUR(5)+CUR(10))/2+CUR(1)+CUR(2)+CUR(7)+CUR(9)
     2 +CUR(13)+CUR(14)
      IF ((BLN.NE.1.AND.I1.LE.UNPROT).OR.(BLN.EQ.1.AND.KT.LE.UNPROT))
     2 SUMC=SUMC+P(5,I5)/2
      IF (SUMC.LT.X(3)) GO TO 340
      SUMD=0
      DO 810 ITER=1,14
  810 SUMD=SUMD+CUR(ITER)
      IF (KT.EQ.1) GO TO 280
      I(BLN)=I(BLN)-1
      NA0=0
      NA2=0
      NA9=0
      NTB=0
      NTC=0
      NTD=0
      IF (UNPROT.GE.I1.AND.Q(5,I5).LT.60) NA0=1
      IF (NA0.EQ.1.AND.Q(2,I2).EQ.-40) NA2=1
      IF (NA0.EQ.1.AND.Q(9,I9).GE.0) NA9=1
      IF (UNPROT.GE.I1.AND.(Q(5,I5).EQ.20.OR.Q(5,I5).EQ.40)) NTB=1
      IF (UNPROT.GE.I1.AND.Q(13,I13).EQ.20) NTC=1
      IF (Q(10,I10).EQ.-60.AND.Q(11,I11).EQ.-60) NTD=1
      SUMA1=(Q(3,I3)+Q(4,I4)+Q(6,I6)+Q(13,I13))/2+Q(1,I1)+
     2 Q(2,I2)+Q(5,I5)+Q(9,I9)
      IF (NA2.EQ.1) SUMA1=SUMA1-Q(2,I2)-70
      IF (NA9.EQ.1) SUMA1=SUMA1-Q(9,I9)-20
      IF (NTB.EQ.1) SUMA1=SUMA1-Q(5,I5)
      IF (NTC.EQ.1) SUMA1=SUMA1-Q(13,I13)/2
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      SUMB1=(Q(2,I2)+Q(5,I5)+Q(9,I9))/2+Q(3,I3)+Q(4,I4)+
     2 Q(8,I8)+Q(10,I10)+Q(11,I11)+Q(12,I12)+Q(13,I13)+Q(14,I14)
      IF (NA2.EQ.1) SUMB1=SUMB1-(Q(2,I2)+70)/2
      IF (NA9.EQ.1) SUMB1=SUMB1-(Q(9,I9)+20)/2
      IF (NTB.EQ.1) SUMB1=SUMB1-Q(5,I5)/2
      IF (NTC.EQ.1) SUMB1=SUMB1-Q(13,I13)
      IF (NTD.EQ.1) SUMB1=SUMB1-Q(11,I11)
      SUMC1=(Q(5,I5)+Q(10,I10))/2+Q(1,I1)+Q(2,I2)+Q(7,I7)+Q(9,I9)+
     2 Q(13,I13)+Q(14,I14)
      IF (NA2.EQ.1) SUMC1=SUMC1-Q(2,I2)-70
      IF (NA9.EQ.1) SUMC1=SUMC1-Q(9,I9)-20
      IF (NTB.EQ.1) SUMC1=SUMC1-Q(5,I5)/2
      IF (NTC.EQ.1) SUMC1=SUMC1-Q(13,I13)
      IF ((BLN.NE.1.AND.I1.LE.UNPROT).OR.(BLN.EQ.1.AND.KT-1.LE.UNPROT))
     2 SUMC1=SUMC1+Q(5,I5)/2
      SUMD1=Q(1,I1)+Q(2,I2)+Q(3,I3)+Q(4,I4)+Q(5,I5)+Q(6,I6)+Q(7,I7)+
     2 Q(8,I8)+Q(9,I9)+Q(10,I10)+Q(11,I11)+Q(12,I12)+Q(13,I13)+Q(14,I14)
      IF (NA2.EQ.1) SUMD1=SUMD1-Q(2,I2)-70
      IF (NA9.EQ.1) SUMD1=SUMD1-Q(9,I9)-20
      IF (NTB.EQ.1) SUMD1=SUMD1-Q(5,I5)
      IF (NTC.EQ.1) SUMD1=SUMD1-Q(13,I13)
      IF (NTD.EQ.1) SUMD1=SUMD1-Q(11,I11)
C
C           IF ANY OF THE COMPUTED SAFETY SUMS OF THE CURRENT
C           COMBINATION ARE LESS THAN THEIR CORRESPONDING MINIMUM
C           SAFETY REQUIREMENTS GO TO THE NEXT COMBINATION.  IF THIS IS
C           THE FIRST LOOP PASS CHECK IF ALL OF THE COMPUTED SAFETY
C           SUMS ARE GREATER THAN THE CORRESPONDING MAXIMUM
C           REQUIREMENTS, AND IF THIS IS SO, GO TO THE NEXT COMB.
C           USUALLY, BETWEEN THE CHECK OF THE CURRENT COMBINATION
C           AGAINST THE MIN. VALUES AND THE CHECK OF THE CURRENT
C           COMB. AGAINST THE MAX. VALUES ELIMINATION OF DUPLICATE
C           SOLUTIONS IS PERFORMED.  SUCH A SOLUTION IS DEFINED TO
C           BE ONE THAT WAS A SOLUTION USING A LOWER VALUE OF THE
C           SORT PARAMETER.   IF NONE OF THE SAFETY SUMS OF THE
C           Q COMBINATION IS LESS THAN THE CORRESPONDING MINIMUM
C           REQUIREMENTS IT FOLLOWS THAT THE Q COMBINATION WAS A
C           SOLUTION IN THE LAST LOOP PASS (UNLESS ITS SUMS WERE ALL
C           TOO LARGE, WHICH WOULD STILL BE TRUE FOR THE CURR. COMB.)
C           THEREFORE, WHEN THIS OCCURS GO TO THE NEXT COMBINATION.
C           FINALLY, JUST BEFORE THE IF CHECKING FOR DUPLICATES IS
C           AN IF STATEMENT THAT TESTS WHETHER A SPECIAL SITUATION
C           IS PRESENT THAT COULD CAUSE PROBLEMS IN DUPLICATE REMOVAL.
C           IF IT IS PRESENT SKIP AROUND THE DUPLICATE CHECKING.
C
280   IF (SUMA.LT.X(1).OR.SUMB.LT.X(2).OR.SUMC.LT.X(3).OR.SUMD.LT.X(4)
     2) GO TO 340
      IF (KT.EQ.1) GO TO 290
      IF (NTD.EQ.1.AND.(BLN.EQ.10.OR.BLN.EQ.11)) GO TO 290
      IF (SUMA1.LT.X(1).OR.SUMB1.LT.X(2).OR.SUMC1.LT.X(3).OR.SUMD1.LT.X(
     24)) GO TO 290
      GO TO 340
290   IF (SUMA.GT.XM(1).AND.SUMB.GT.XM(2).AND.SUMC.GT.XM(3).AND.SUMD.GT.
     2XM(4)) GO TO 340
C
C           IF CONTROL REACHES THIS POINT THE CURRENT COMBINATION
C           WAS SUCCESSFUL. ADD 1 TO THE COUNTER OF SOLUTIONS FOUND
C           IN THE CURRENT LOOP PASS, AND IF IT IS GREATER THAN
```

```
C            1111 SET THE TOTAL-MESSAGE FLAG TO 2 AND LEAVE THE        A
C            LOOP PASS. IF FLAG=1 THE NUMBER OF SOLUTIONS FOUND IS
C            ALREADY GREATER THAN THE NUMBER IT IS DESIRED TO PRINT,
C            SO TRANSFER TO THE NEXT COMBINATION WITHOUT DOING
C            ANYTHING ELSE.  IF FLAG IS NOT 1 ADD 1 TO THE COUNTER OF
C            LINES PRINTED AND CHECK AGAINST THE DESIRED NUMBER.
C
      IF (ICOUNT.GE.1) GO TO 920
      DO 910 ITER=1,14
  910 SOLS(1,ITER)=CUR(ITER)
      GO TO 960
  920 DO 940 ITER1=ICOUNT,1,-1
      NEWT=0
      DO 930 ITER2=1,14
      IF (CUR(ITER2).LT.SOLS(ITER1,ITER2)) NEWT=1
  930 CONTINUE
      IF (NEWT.EQ.0) GO TO 340
  940 CONTINUE
      DO 950 ITER=1,14
  950 SOLS(ICOUNT+1,ITER)=CUR(ITER)
  960 CONTINUE
C
      CYCLES=CYCLES+1
      IF (CYCLES.LE.1111) GO TO 300
      FLAG=2
      GO TO 370
  300 IF (FLAG.EQ.1) GO TO 340
      ICOUNT=ICOUNT+1
      IF (ICOUNT.EQ.NMAX) FLAG=1
C
C            IN PREPARATION TO PRINTING OUT THE SUCCESSFUL COMBINATION
C            USE THE POINTERS IN THE CHANGE ARRAY TO MOVE INTO THE
C            ARRAY R THE SOLUTION VALUES OF THE NONCONSTANT PARAMETERS.
C            USE THE SAME POINTERS TO COMPRESS THE PFLAGS ARRAY SO THAT
C            THE ASTERISKS APPEAR NEXT TO THE CORRECT PARAMETER VALUE.
C
      DO 310 ITER=1,CT
      L=CHANGE(ITER)
      M=I(L)
      PFLAGS(ITER)=PFLAGS(L)
  310 R(ITER)=P(L,M)/10
      R(15)=SUMA
      R(16)=SUMB
      R(17)=SUMC
      R(18)=SUMD
C
C            PERFORM THE ACTUAL PRINTING. IF THE NUMBER OF LINES ON
C            THE PAGE IS 57, GO TO THE NEXT PAGE AND PRINT OUT
C            THE NECESSARY HEADINGS BEFORE WRITING THE SOLUTION.
C            OTHERWISE, JUST WRITE OUT THE SOLUTION, ADDING 1 TO
C            THE SOLUTION NUMBER AND THE LINES PER PAGE COUNTER.
C
      IF (LINES.NE.57) GO TO 330
      LINES=0
      WRITE (6,530) (TITLE(K),K=1,18)
      IF (BLN.EQ.0) GO TO 320
      LINES=2
      IF (KT.EQ.1) WRITE (6,540) DIV,(PN(BLN,K),K=1,8)
```

```
      IF (KT.GT.1) WRITE (6,550) DIV,(PN(BLN,K),K=1,8)
320   WRITE (6,430)
      WRITE (6,560) (TJ(K2,1),K2=1,TWOCT),(TJ(K3,1),K3=29,36)
      WRITE (6,620) (TJ(K2,2),K2=1,TWOCT),(TJ(K3,2),K3=29,36)
      WRITE (6,630) (PNUMB2(K),K=1,CT)
      WRITE (6,450)
      LINES=LINES+6
330   WRITE (6,570) LINESP,(CONDS(K),K=1,5),(R(K),PFLAGS(K),K=1,CT),(R(K
     2),BLANK,K=15,18)
      LINES=LINES+1
      LINESP=LINESP+1
C
C           END OF THE NESTED DO LOOPS.
C
340   CONTINUE
350   CONTINUE
C
C
C
C
C
C
C
C
C
C           IF NO SOLUTIONS WERE FOUND DURING THE CURRENT LOOP PASS,
C           WRITE OUT THE USUAL HEADINGS FOLLOWED BY A MESSAGE
C           EXPLAINING THE SITUATION.
C
      IF (ICOUNT.NE.0) GO TO 370
      WRITE (6,530) (TITLE(K),K=1,18)
      IF (BLN.EQ.0) GO TO 360
      IF (KT.EQ.1) WRITE (6,540) DIV,(PN(BLN,K),K=1,8)
      IF (KT.GT.1) WRITE (6,550) DIV,(PN(BLN,K),K=1,8)
360   WRITE (6,600)
      GO TO 380
C
C           WRITE OUT THE RELEVANT TOTAL MESSAGE ON THE PAGE
C           FOLLOWING THE LAST OUTPUT OF THE CURRENT PASS, WITH
C           FLAG AS THE GUIDE TO THE CORRECT MESSAGE.
C
370   IF (FLAG.EQ.0) WRITE (6,590) ICOUNT
      IF (FLAG.EQ.1) WRITE (6,610) CYCLES,ICOUNT
      IF (FLAG.EQ.2) WRITE (6,580) ICOUNT
C
C           IF BLN=0 ONE LOOP PASS WAS SUFFICIENT, THEREFORE GO
C           READ IN A NEW SET OF DATA. OTHERWISE, ADD 1 TO KT AND
C           CHECK IF ALL VALUES OF THE SORT PARAMETER HAVE BEEN
C           EXHAUSTED.  IF THERE ARE STILL SOME VALUES THAT
C           REMAIN TO BE USED, ASSIGN THE PRESENT SORT PARAMETER VALUE
C           TO LAST, SET THE NEW CURRENT SORT PARAM. VALUE, AND
C           START ANOTHER LOOP PASS.
C
380   IF (BLN.EQ.0) GO TO 10
      KT=KT+1
      IF (KT.GT.BLC) GO TO 10
      LAST=P(BLN,1)
      P(BLN,1)=P(BLN,KT)
      GO TO 140
```

```
      C
      C
      C        CONTROL REACHES THE STOP WHEN THERE IS NO MORE DATA TO READ.
      C
  400 STOP
      C
      C
      C
      C
      C
      C
      C
      C        ALL THE FORMAT STATEMENTS OF THE MAIN PROGRAM NOW FOLLOW.
      C
  410  FORMAT (1H1)
  420  FORMAT (18A4)
  424  FORMAT ()
  430  FORMAT ('0')
  440  FORMAT ('0PARAMETERS WHICH ARE HELD CONSTANT AND THE VALUES OF',
     2 ' EACH')
  450  FORMAT (' ')
  460  FORMAT ('0',8A4,10I4)
  470  FORMAT ('0','NONE')
  480  FORMAT ('0',8A4,10(I3,A1))
  490  FORMAT ('0PARAMETERS WHICH ARE VARIED AND THE VALUES WHICH ARE ',
     2 'USED')
  500  FORMAT (' PARAMETER VARIATION ANALYSIS PERFORMED FOR',1X,8A4/' ',
     2 43X,'USING THE VALUES ',7I4)
  510  FORMAT ('0SPECIFIED MINIMUM TOTAL SAFETY VALUES',T80,'SPECIFIED ',
     2 'MAXIMUM TOTAL SAFETY VALUES'//'0FIRE CONTROL',I4,T80,
     3 'FIRE CONTROL',I4/
     4 '0EGRESS PROVIDED',I4,T80,'EGRESS ',
     5 'PROVIDED',I4/'0REFUGE PROVIDED',I4,T80,'REFUGE PROVIDED',I4/
     6 '0GENERAL SAFETY',I4,T80,'GENERAL SAFETY',I4)
  520  FORMAT ('1INPUT ERROR - THERE IS NO VALID PARAMETER ',
     2 'ANALYSIS NUMBER',I5)
  530  FORMAT ('1',18A4)
  540  FORMAT ('0COMBINATIONS USING A VALUE OF',I4,' FOR ',8A4)
  550  FORMAT ('0NEW COMBINATIONS USING A VALUE OF',I4,' FOR ',8A4)
  560  FORMAT (12X,20(1X,A3,A2))
  570  FORMAT (1X,I4,2X,5A1,2X,I4,A1,19(I5,A1))
  580  FORMAT ('1MORE THAN 1111 COMBINATIONS HAVE BEEN FOUND.FIRST',I6,
     2 ' HAVE BEEN PRINTED.')
  590  FORMAT ('1',I6,' COMBINATIONS HAVE BEEN FOUND')
  600  FORMAT ('0THERE ARE NO COMBINATIONS WHICH SATISFY THE CONDITIONS.'
     2)
  610  FORMAT ('1',I6,' COMBINATIONS HAVE BEEN FOUND. FIRST',I6,
     2 ' HAVE BEEN PRINTED.')
  620  FORMAT (1X,'SOL#--CASES',20(1X,A3,A2))
  630  FORMAT (14X,15(A4,2X))
       C
       END
END PRT

@BRKPT PRINT$
```

SECTION G - Examples 1 and 2

Example 1 input

```
Example 1
1    2    0
1    0
2   -1    2
1    0
1    2
2   -1    0
2    0    1
2    0    1
2    2    4
2   -6   -2
3   -2    0    2
2   -1    0
2    0    2
2    3    4
0    0    0    0
90   90   90   90
1000
0
```

Example 2 input

```
Example 2
2   -2    2    1
2   -4    0
2   -1    2
2    0    2
2    0    2
2   -1    0
2    0    1
2    0    1
2   -6   -2
2   -2    0
2   -2   -1
2   -1    0
2    0    2
2    0    2
-100 -100 -100 -100
60   60   60   60
1000
7
```

EXAMPLE 1

PARAMETERS WHICH ARE HELD CONSTANT AND THE VALUES OF EACH

CONSTRUCTION	2
HAZARDOUS AREAS	0
SMOKE DETECTION AND ALARM	0
AUTOMATIC SPRINKLERS	2

PARAMETERS WHICH ARE VARIED AND THE VALUES WHICH ARE USED

MANUAL FIRE ALARM	-1	2	
INTERIOR FINISH IN LIVING UNITS	-1	0	
LIVING UNIT BEDROOM(DRS/OPENNGS)	0	1	
EGRESS FROM LIVING UNITS	0	1	
SEPARATION OF LIVING UNITS	2	4	
EXIT QUALITY	-6	-2	
EXIT ACCESS	-2	0	2
INTERIOR FINISH (EGRESS ROUTES)	-1	0	
VERTICAL OPENINGS	0	2	
SMOKE CONTROL	3	4	

SPECIFIED MINIMUM TOTAL SAFETY VALUES

FIRE CONTROL	0
EGRESS PROVIDED	0
REFUGE PROVIDED	0
GENERAL SAFETY	0

SPECIFIED MAXIMUM TOTAL SAFETY VALUES

FIRE CONTROL	90
EGRESS PROVIDED	90
REFUGE PROVIDED	90
GENERAL SAFETY	90

EXAMPLE 1

SOL#--CASES	MANU. ALARM P#03	FINSH UNITS P#06	UNIT BEDRM P#07	EGRSS UNITS P#08	SEPAR UNITS P#09	EXIT QUALT P#10	EXIT ACCSS P#11	FINSH EGRSS P#12	VERT OPEN P#13	SMOKE CNTRL P#14	FIRE CNTRL	EGRSS PROV	REFUG PROV	GENRL SAF.
1	-1	-1	0	0	2	-6	0	-1	2	4	60	0	80	30
2	-1	-1	0	0	2	-6	0	0	2	3	60	0	70	30
3	-1	-1	0	0	2	-6	2	-1	0	4	50	0	60	30
4	-1	-1	0	0	2	-6	2	-1	2	3	60	10	70	40
5	-1	-1	0	0	2	-6	2	0	0	3	50	0	50	30
6	-1	-1	0	0	2	-2	-2	-1	0	4	50	0	80	30
7	-1	-1	0	0	2	-2	-2	-1	2	3	60	10	90	40
8	-1	-1	0	0	2	-2	-2	0	0	3	50	0	70	30
9	-1	-1	0	0	2	-2	0	-1	0	3	50	10	70	40
10	-1	-1	0	0	4	-6	-2	0	2	4	80	0	100	40
11	-1	-1	0	0	4	-6	0	-1	2	3	80	0	90	40
12	-1	-1	0	0	4	-6	0	0	0	4	70	0	80	40
13	-1	-1	0	0	4	-6	2	-1	0	3	70	0	70	40
14	-1	-1	0	0	4	-2	-2	-1	0	3	70	0	90	40
15	-1	-1	0	1	2	-6	-2	0	2	4	60	0	80	30
16	-1	-1	0	1	2	-6	0	-1	2	3	60	0	70	30
17	-1	-1	0	1	2	-6	0	0	0	4	50	0	60	30
18	-1	-1	0	1	2	-6	2	-1	0	3	50	0	50	30
19	-1	-1	0	1	2	-2	-2	-1	0	3	50	0	70	30
20	-1	-1	0	1	4	-6	-2	-1	2	4	80	0	100	40
21	-1	-1	0	1	4	-6	-2	0	2	3	80	0	90	40
22	-1	-1	0	1	4	-6	0	-1	0	4	70	0	80	40
23	-1	-1	0	1	4	-6	0	0	0	3	70	0	70	40
24	2	-1	0	0	2	-6	-2	-1	2	3	75	0	70	30
25	2	-1	0	0	2	-6	-2	0	0	4	65	0	60	30
26	2	-1	0	0	2	-6	0	-1	0	3	65	0	50	30
27	2	-1	0	0	2	-2	-2	-1	0	3	65	20	70	50
28	2	-1	0	0	4	-6	-2	-1	0	4	85	0	80	40
29	2	-1	0	0	4	-6	-2	0	0	3	85	0	70	40
30	2	-1	0	1	2	-6	-2	-1	0	4	65	0	60	30
31	2	-1	0	1	2	-6	-2	0	0	3	65	0	50	30
32	2	-1	0	1	4	-6	-2	-1	0	3	85	0	70	40

32 COMBINATIONS HAVE BEEN FOUND

EXAMPLE 2

PARAMETERS WHICH ARE HELD CONSTANT AND THE VALUES OF EACH

NONE

PARAMETERS WHICH ARE VARIED AND THE VALUES WHICH ARE USED

CONSTRUCTION	-2U	2
HAZARDOUS AREAS	-4	0
MANUAL FIRE ALARM	-1	2
SMOKE DETECTION AND ALARM	0	2
AUTOMATIC SPRINKLERS	0	2
INTERIOR FINISH IN LIVING UNITS	-1	0
LIVING UNIT BEDROOM(DRS/OPENNGS)	0	1
EGRESS FROM LIVING UNITS	0	1
SEPARATION OF LIVING UNITS	-6	-2
EXIT QUALITY	-2	0
EXIT ACCESS	-2	-1
INTERIOR FINISH (EGRESS ROUTES)	-1	0
VERTICAL OPENINGS	0	2
SMOKE CONTROL	0	2

SPECIFIED MINIMUM TOTAL SAFETY VALUES

FIRE CONTROL-100

EGRESS PROVIDED-100

REFUGE PROVIDED-100

GENERAL SAFETY-100

SPECIFIED MAXIMUM TOTAL SAFETY VALUES

FIRE CONTROL 60

EGRESS PROVIDED 60

REFUGE PROVIDED 60

GENERAL SAFETY 60

PARAMETER VARIATION ANALYSIS PERFORMED FOR LIVING UNIT BEDROOM(DRS/OPENNGS)
USING THE VALUES 0 1

EXAMPLE 2

COMBINATIONS USING A VALUE OF 0 FOR LIVING UNIT BEDROOM(DRS/OPENNGS)

SOL#--CASES		CONST P#01	HAZAR AREAS P#02	MANU. ALARM P#03	SMOKE DETEC P#04	AUTOM SPRIN P#05	FINSH UNITS P#06	EGRSS UNITS P#08	SEPAR UNITS P#09	EXIT QUALT P#10	EXIT ACCSS P#11	FINSH EGRSS P#12	VERT OPEN P#13	SMOKE CNTRL P#14	FIRE CNTRL	EGRSS PROV	REFUG PROV	GENRL SAF.
1	A	-2	-4*	2	0	0	0	0	-2	-2	-1	0	0	2	-100	-35	-100	-100
2	A	-2	-4*	2	0	0	0	0	-2	0	-2	-1	0	2	-100	-35	-90	-100
3	A	-2	-4*	2	0	0	0	1	-2	-2	-2	0	0	2	-100	-35	-100	-100
4	A	-2	-4*	2	0	0	0	1	-2	-2	-1	-1	0	2	-100	-35	-100	-100
5	AB	-2	-4*	2	0	2*	0	0	-2	0	-1	0	0	0	-100	-35	-100	-100
6	AB	-2	-4*	2	0	2*	0	1	-2	0	-2	0	0	0	-100	-35	-100	-100
7	AB	-2	-4*	2	0	2*	0	1	-2	0	-1	-1	0	0	-100	-35	-100	-100
8	A	-2	-4*	2	2	0	-1	0	-2	-2	-2	0	0	2	-95	-25	-100	-100
9	A	-2	-4*	2	2	0	-1	0	-2	-2	-1	-1	0	2	-95	-25	-100	-100
10	A	-2	-4*	2	2	0	-1	0	-2	0	-2	-1	0	2	-95	-15	-90	-90
11	A	-2	-4*	2	2	0	-1	1	-2	-2	-2	-1	0	2	-95	-25	-100	-100
12	A	-2	-4*	2	2	0	0	0	-2	-2	-2	-1	0	2	-90	-35	-100	-100
13	AB	-2	-4*	2	2	2*	-1	0	-2	0	-2	0	0	0	-95	-25	-100	-100
14	AB	-2	-4*	2	2	2*	-1	0	-2	0	-1	-1	0	0	-95	-25	-100	-100
15	AB	-2	-4*	2	2	2*	-1	1	-2	0	-2	-1	0	0	-95	-25	-100	-100
16	AB	-2	-4*	2	2	2*	0	0	-2	0	-2	-1	0	0	-90	-35	-100	-100
17		-2	0	-1	0	0	-1	0	-6	0	-2	0	0	2	-90	-40	-60	-100
18		-2	0	-1	0	0	-1	0	-6	0	-1	-1	0	2	-90	-40	-60	-100
19		-2	0	-1	0	0	-1	0	-2	-2	-2	-1	0	2	-50	-50	-30	-90
20		-2	0	-1	0	0	-1	0	-2	-2	-2	0	0	0	-50	-60	-50	-100
21		-2	0	-1	0	0	-1	0	-2	-2	-1	-1	0	0	-50	-60	-50	-100
22		-2	0	-1	0	0	-1	0	-2	0	-2	-1	0	0	-50	-50	-40	-90
23		-2	0	-1	0	0	-1	1	-6	-2	-1	0	0	2	-90	-40	-70	-100
24		-2	0	-1	0	0	-1	1	-6	0	-2	-1	0	2	-90	-40	-60	-100
25		-2	0	-1	0	0	-1	1	-6	0	-1	0	0	0	-90	-40	-80	-100
26		-2	0	-1	0	0	-1	1	-2	-2	-2	-1	0	0	-50	-60	-50	-100
27		-2	0	-1	0	0	0	0	-6	-2	-1	0	0	2	-85	-50	-70	-100
28		-2	0	-1	0	0	0	0	-6	0	-2	-1	0	2	-85	-50	-60	-100
29		-2	0	-1	0	0	0	0	-6	0	-1	0	0	0	-85	-50	-80	-100
30		-2	0	-1	0	0	0	0	-2	-2	-2	-1	0	0	-45	-70	-50	-100
31		-2	0	-1	0	0	0	1	-6	-2	-2	0	0	2	-85	-50	-70	-100
32		-2	0	-1	0	0	0	1	-6	-2	-1	-1	0	2	-85	-50	-70	-100
33		-2	0	-1	0	0	0	1	-6	0	-2	0	0	0	-85	-50	-80	-100
34		-2	0	-1	0	0	0	1	-6	0	-1	-1	0	0	-85	-50	-80	-100
35		-2	0	-1	2	0	-1	0	-6	-2	-2	0	0	2	-80	-40	-70	-100
36		-2	0	-1	2	0	-1	0	-6	-2	-1	-1	0	2	-80	-40	-70	-100
37		-2	0	-1	2	0	-1	0	-6	0	-2	-1	0	2	-80	-30	-60	-90
38		-2	0	-1	2	0	-1	0	-6	0	-2	0	0	0	-80	-40	-80	-100
39		-2	0	-1	2	0	-1	0	-6	0	-1	-1	0	0	-80	-40	-80	-100
40		-2	0	-1	2	0	-1	0	-2	-2	-2	-1	0	0	-40	-50	-50	-90
41		-2	0	-1	2	0	-1	1	-6	-2	-2	-1	0	2	-80	-40	-70	-100
42		-2	0	-1	2	0	-1	1	-6	-2	-1	0	0	0	-80	-40	-90	-100
43		-2	0	-1	2	0	-1	1	-6	0	-2	-1	0	0	-80	-40	-80	-100
44		-2	0	-1	2	0	0	0	-6	-2	-2	-1	0	2	-75	-50	-70	-100
45		-2	0	-1	2	0	0	0	-6	-2	-1	0	0	0	-75	-50	-90	-100
46		-2	0	-1	2	0	0	0	-6	0	-2	-1	0	0	-75	-50	-80	-100
47		-2	0	-1	2	0	0	1	-6	-2	-2	0	0	0	-75	-50	-90	-100
48		-2	0	-1	2	0	0	1	-6	-2	-1	-1	0	0	-75	-50	-90	-100
49		-2	0	2	0	0	-1	0	-6	-2	-2	-1	0	2	-75	-40	-70	-100

EXAMPLE 2

COMBINATIONS USING A VALUE OF 0 FOR LIVING UNIT BEDROOM(DRS/OPENNGS)

SOL#--CASES	CONST P#01	HAZAR AREAS P#02	MANU. ALARM P#03	SMOKE DETEC P#04	AUTOM SPRIN P#05	FINSH UNITS P#06	EGRSS UNITS P#08	SEPAR UNITS P#09	EXIT QUALT P#10	EXIT ACCSS P#11	FINSH EGRSS P#12	VERT OPEN P#13	SMOKE CNTRL P#14	FIRE CNTRL	EGRSS PROV	REFUG PROV	GENRL SAF.
50	-2	0	2	0	0	-1	0	-6	-2	-1	0	0	0	-75	-40	-90	-100
51	-2	0	2	0	0	-1	0	-6	0	-2	-1	0	0	-75	-40	-80	-100
52	-2	0	2	0	0	-1	0	-2	-2	-2	-1	0	0	-35	-40	-50	-80
53	-2	0	2	0	0	-1	1	-6	-2	-2	0	0	0	-75	-40	-90	-100
54	-2	0	2	0	0	-1	1	-6	-2	-1	-1	0	0	-75	-40	-90	-100
55	-2	0	2	0	0	0	0	-6	-2	-2	0	0	0	-70	-50	-90	-100
56	-2	0	2	0	0	0	0	-6	-2	-1	-1	0	0	-70	-50	-90	-100
57	-2	0	2	0	0	0	1	-6	-2	-2	-1	0	0	-70	-50	-90	-100
58	-2	0	2	2	0	-1	0	-6	-2	-2	-1	0	0	-65	-40	-90	-100
59	2	-4	-1	0	0	-1	0	-6	-2	-2	0	2	2	-80	-60	-50	-100
60	2	-4	-1	0	0	-1	0	-6	-2	-1	-1	2	2	-80	-60	-50	-100
61	2	-4	-1	0	0	-1	0	-6	0	-2	-1	2	2	-80	-50	-40	-90
62	2	-4	-1	0	0	-1	0	-6	0	-2	0	0	2	-90	-60	-60	-100
63	2	-4	-1	0	0	-1	0	-6	0	-2	0	2	0	-80	-60	-60	-100
64	2	-4	-1	0	0	-1	0	-6	0	-1	-1	0	2	-90	-60	-60	-100
65	2	-4	-1	0	0	-1	0	-6	0	-1	-1	2	0	-80	-60	-60	-100
66	2	-4	-1	0	0	-1	0	-2	-2	-2	-1	0	2	-50	-70	-30	-90
67	2	-4	-1	0	0	-1	0	-2	-2	-2	-1	2	0	-40	-70	-30	-90
68	2	-4	-1	0	0	-1	0	-2	-2	-2	0	0	0	-50	-80	-50	-100
69	2	-4	-1	0	0	-1	0	-2	-2	-1	-1	0	0	-50	-80	-50	-100
70	2	-4	-1	0	0	-1	0	-2	0	-2	-1	0	0	-50	-70	-40	-90
71	2	-4	-1	0	0	-1	1	-6	-2	-2	-1	2	2	-80	-60	-50	-100
72	2	-4	-1	0	0	-1	1	-6	-2	-1	0	0	2	-90	-60	-70	-100
73	2	-4	-1	0	0	-1	1	-6	-2	-1	0	2	0	-80	-60	-70	-100
74	2	-4	-1	0	0	-1	1	-6	0	-2	-1	0	2	-90	-60	-60	-100
75	2	-4	-1	0	0	-1	1	-6	0	-2	-1	2	0	-80	-60	-60	-100
76	2	-4	-1	0	0	-1	1	-6	0	-1	0	0	0	-90	-60	-80	-100
77	2	-4	-1	0	0	-1	1	-2	-2	-2	-1	0	0	-50	-80	-50	-100
78	2	-4	-1	0	0	0	0	-6	-2	-2	-1	2	2	-75	-70	-50	-100
79	2	-4	-1	0	0	0	0	-6	-2	-1	0	0	2	-85	-70	-70	-100
80	2	-4	-1	0	0	0	0	-6	-2	-1	0	2	0	-75	-70	-70	-100
81	2	-4	-1	0	0	0	0	-6	0	-2	-1	0	2	-85	-70	-60	-100
82	2	-4	-1	0	0	0	0	-6	0	-2	-1	2	0	-75	-70	-60	-100
83	2	-4	-1	0	0	0	0	-6	0	-1	0	0	0	-85	-70	-80	-100
84	2	-4	-1	0	0	0	0	-2	-2	-2	-1	0	0	-45	-90	-50	-100
85	2	-4	-1	0	0	0	1	-6	-2	-2	0	0	2	-85	-70	-70	-100
86	2	-4	-1	0	0	0	1	-6	-2	-2	0	2	0	-75	-70	-70	-100
87	2	-4	-1	0	0	0	1	-6	-2	-1	-1	0	2	-85	-70	-70	-100
88	2	-4	-1	0	0	0	1	-6	-2	-1	-1	2	0	-75	-70	-70	-100
89	2	-4	-1	0	0	0	1	-6	0	-2	0	0	0	-85	-70	-80	-100
90	2	-4	-1	0	0	0	1	-6	0	-1	-1	0	0	-85	-70	-80	-100
91	2	-4	-1	0	2	-1	0	-6	-2	-2	-1	2	2	-60	-60	-40	-90
92	2	-4	-1	0	2	-1	0	-6	-2	-2	0	0	2	-70	-70	-60	-100
93	2	-4	-1	0	2	-1	0	-6	-2	-2	0	2	0	-60	-70	-60	-100
94	2	-4	-1	0	2	-1	0	-6	-2	-1	-1	0	2	-70	-70	-60	-100
95	2	-4	-1	0	2	-1	0	-6	-2	-1	-1	2	0	-60	-70	-60	-100
96	2	-4	-1	0	2	-1	0	-6	0	-2	-1	0	2	-70	-60	-50	-90
97	2	-4	-1	0	2	-1	0	-6	0	-2	-1	2	0	-60	-60	-50	-90
98	2	-4	-1	0	2	-1	0	-6	0	-2	0	0	0	-70	-70	-70	-100

EXAMPLE 2

COMBINATIONS USING A VALUE OF 0 FOR LIVING UNIT BEDROOM(DRS/OPENNGS)

SOL#--CASES	CONST P#01	HAZAR AREAS P#02	MANU. ALARM P#03	SMOKE DETEC P#04	AUTOM SPRIN P#05	FINSH UNITS P#06	EGRSS UNITS P#08	SEPAR UNITS P#09	EXIT QUALT P#10	EXIT ACCSS P#11	FINSH EGRSS P#12	VERT OPEN P#13	SMOKE CNTRL P#14	FIRE CNTRL	EGRSS PROV	REFUG PROV	GENRL SAF.
99	2	-4	-1	0	2	-1	0	-6	0	-1	-1	0	0	-70	-70	-70	-100
100	2	-4	-1	0	2	-1	0	-2	-2	-2	-1	0	0	-30	-80	-40	-90
101	2	-4	-1	0	2	-1	1	-6	-2	-2	-1	0	2	-70	-70	-60	-100
102	2	-4	-1	0	2	-1	1	-6	-2	-2	-1	2	0	-60	-70	-60	-100
103	2	-4	-1	0	2	-1	1	-6	-2	-1	0	0	0	-70	-70	-80	-100
104	2	-4	-1	0	2	-1	1	-6	0	-2	-1	0	0	-70	-70	-70	-100
105	2	-4	-1	0	2	0	0	-6	-2	-2	-1	0	2	-65	-80	-60	-100
106	2	-4	-1	0	2	0	0	-6	-2	-2	-1	2	0	-55	-80	-60	-100
107	2	-4	-1	0	2	0	0	-6	-2	-1	0	0	0	-65	-80	-80	-100
108	2	-4	-1	0	2	0	0	-6	0	-2	-1	0	0	-65	-80	-70	-100
109	2	-4	-1	0	2	0	1	-6	-2	-2	0	0	0	-65	-80	-80	-100
110	2	-4	-1	0	2	0	1	-6	-2	-1	-1	0	0	-65	-80	-80	-100
111	2	-4	-1	2	0	-1	0	-6	-2	-2	-1	2	2	-70	-50	-50	-90
112	2	-4	-1	2	0	-1	0	-6	-2	-2	0	0	2	-80	-60	-70	-100
113	2	-4	-1	2	0	-1	0	-6	-2	-2	0	2	0	-70	-60	-70	-100
114	2	-4	-1	2	0	-1	0	-6	-2	-1	-1	0	2	-80	-60	-70	-100
115	2	-4	-1	2	0	-1	0	-6	-2	-1	-1	2	0	-70	-60	-70	-100
116	2	-4	-1	2	0	-1	0	-6	0	-2	-1	0	2	-80	-50	-60	-90
117	2	-4	-1	2	0	-1	0	-6	0	-2	-1	2	0	-70	-50	-60	-90
118	2	-4	-1	2	0	-1	0	-6	0	-2	0	0	0	-80	-60	-80	-100
119	2	-4	-1	2	0	-1	0	-6	0	-1	-1	0	0	-80	-60	-80	-100
120	2	-4	-1	2	0	-1	0	-2	-2	-2	-1	0	0	-40	-70	-50	-90
121	2	-4	-1	2	0	-1	1	-6	-2	-2	-1	0	2	-80	-60	-70	-100
122	2	-4	-1	2	0	-1	1	-6	-2	-2	-1	2	0	-70	-60	-70	-100
123	2	-4	-1	2	0	-1	1	-6	-2	-1	0	0	0	-80	-60	-90	-100
124	2	-4	-1	2	0	-1	1	-6	0	-2	-1	0	0	-80	-60	-80	-100
125	2	-4	-1	2	0	0	0	-6	-2	-2	-1	0	2	-75	-70	-70	-100
126	2	-4	-1	2	0	0	0	-6	-2	-2	-1	2	0	-65	-70	-70	-100
127	2	-4	-1	2	0	0	0	-6	-2	-1	0	0	0	-75	-70	-90	-100
128	2	-4	-1	2	0	0	0	-6	0	-2	-1	0	0	-75	-70	-80	-100
129	2	-4	-1	2	0	0	1	-6	-2	-2	0	0	0	-75	-70	-90	-100
130	2	-4	-1	2	0	0	1	-6	-2	-1	-1	0	0	-75	-70	-90	-100
131	2	-4	-1	2	2	-1	0	-6	-2	-2	-1	0	2	-60	-60	-60	-90
132	2	-4	-1	2	2	-1	0	-6	-2	-2	-1	2	0	-50	-60	-60	-90
133	2	-4	-1	2	2	-1	0	-6	-2	-2	0	0	0	-60	-70	-80	-100
134	2	-4	-1	2	2	-1	0	-6	-2	-1	-1	0	0	-60	-70	-80	-100
135	2	-4	-1	2	2	-1	0	-6	0	-2	-1	0	0	-60	-60	-70	-90
136	2	-4	-1	2	2	-1	1	-6	-2	-2	-1	0	0	-60	-70	-80	-100
137	2	-4	-1	2	2	0	0	-6	-2	-2	-1	0	0	-55	-80	-80	-100
138	2	-4	2	0	0	-1	0	-6	-2	-2	-1	0	2	-75	-60	-70	-100
139	2	-4	2	0	0	-1	0	-6	-2	-2	-1	2	0	-65	-60	-70	-100
140	2	-4	2	0	0	-1	0	-6	-2	-1	0	0	0	-75	-60	-90	-100
141	2	-4	2	0	0	-1	0	-6	0	-2	-1	0	0	-75	-60	-80	-100
142	2	-4	2	0	0	-1	0	-2	-2	-2	-1	0	0	-35	-60	-50	-80
143	2	-4	2	0	0	-1	1	-6	-2	-2	0	0	0	-75	-60	-90	-100
144	2	-4	2	0	0	-1	1	-6	-2	-1	-1	0	0	-75	-60	-90	-100
145	2	-4	2	0	0	0	0	-6	-2	-2	0	0	0	-70	-70	-90	-100
146	2	-4	2	0	0	0	0	-6	-2	-1	-1	0	0	-70	-70	-90	-100
147	2	-4	2	0	0	0	1	-6	-2	-2	-1	0	0	-70	-70	-90	-100

EXAMPLE 2

COMBINATIONS USING A VALUE OF 0 FOR LIVING UNIT BEDROOM(DRS/OPENNGS)

SOL#--CASES	CONST P#01	HAZAR AREAS P#02	MANU. ALARM P#03	SMOKE DETEC P#04	AUTOM SPRIN P#05	FINSH UNITS P#06	EGRSS UNITS P#08	SEPAR UNITS P#09	EXIT QUALT P#10	EXIT ACCSS P#11	FINSH EGRSS P#12	VERT OPEN P#13	SMOKE CNTRL P#14	FIRE CNTRL	EGRSS PROV	REFUG PROV	GENRL SAF.
148	2	-4	2	0	2	-1	0	-6	-2	-2	-1	0	0	-55	-70	-80	-100
149	2	-4	2	2	0	-1	0	-6	-2	-2	-1	0	0	-65	-60	-90	-100
150	2	0	-1	0	0	-1	0	-6	-2	-2	-1	0	2	-50	-70	-30	-90
151	2	0	-1	0	0	-1	0	-6	-2	-2	-1	2	0	-40	-70	-30	-90
152	2	0	-1	0	0	-1	0	-6	-2	-2	0	0	0	-50	-80	-50	-100
153	2	0	-1	0	0	-1	0	-6	-2	-1	-1	0	0	-50	-80	-50	-100
154	2	0	-1	0	0	-1	0	-6	0	-2	-1	0	0	-50	-70	-40	-90
155	2	0	-1	0	0	-1	0	-2	-2	-2	-1	0	0	-10	-70	-10	-70
156	2	0	-1	0	0	-1	1	-6	-2	-2	-1	0	0	-50	-80	-50	-100
157	2	0	-1	0	0	0	0	-6	-2	-2	-1	0	0	-45	-90	-50	-100
158	2	0	-1	0	2	-1	0	-6	-2	-2	-1	0	0	-30	-80	-40	-90
159	2	0	-1	2	0	-1	0	-6	-2	-2	-1	0	0	-40	-70	-50	-90
160	2	0	2	0	0	-1	0	-6	-2	-2	-1	0	0	-35	-60	-50	-80

160 COMBINATIONS HAVE BEEN FOUND

EXAMPLE 2

NEW COMBINATIONS USING A VALUE OF 1 FOR LIVING UNIT BEDROOM(DRS/OPENNGS)

SOL#	CASES	CONST P#01	HAZAR AREAS P#02	MANU. ALARM P#03	SMOKE DETEC P#04	AUTOM SPRIN P#05	FINSH UNITS P#06	EGRSS UNITS P#08	SEPAR UNITS P#09	EXIT QUALT P#10	EXIT ACCSS P#11	FINSH EGRSS P#12	VERT OPEN P#13	SMOKE CNTRL P#14	FIRE CNTRL	EGRSS PROV	REFUG PROV	GENRL SAF.
161	A	-2	-4*	2	0	0	0	0	-2	-2	-2	0	0	2	-100	-45	-90	-100
162	A	-2	-4*	2	0	0	0	0	-2	-2	-1	-1	0	2	-100	-45	-90	-100
163	A	-2	-4*	2	0	0	0	0	-2	0	-2	0	0	0	-100	-45	-100	-100
164	A	-2	-4*	2	0	0	0	0	-2	0	-1	-1	0	0	-100	-45	-100	-100
165	A	-2	-4*	2	0	0	0	1	-2	-2	-2	-1	0	2	-100	-45	-90	-100
166	A	-2	-4*	2	0	0	0	1	-2	0	-2	-1	0	0	-100	-45	-100	-100
167	AB	-2	-4*	2	0	2*	0	1	-2	-2	-1	0	0	0	-100	-45	-100	-100
168	A	-2	-4*	2	2	0	-1	0	-2	-2	-2	-1	0	2	-95	-35	-90	-100
169	A	-2	-4*	2	2	0	-1	0	-2	0	-2	-1	0	0	-95	-35	-100	-100
170	AB	-2	-4*	2	2	2*	-1	0	-2	-2	-1	0	0	0	-95	-35	-100	-100
171	AB	-2	-4*	2	2	2*	-1	1	-2	-2	-2	0	0	0	-95	-35	-100	-100
172	AB	-2	-4*	2	2	2*	-1	1	-2	-2	-1	-1	0	0	-95	-35	-100	-100
173	AB	-2	-4*	2	2	2*	0	0	-2	-2	-2	0	0	0	-90	-45	-100	-100
174	AB	-2	-4*	2	2	2*	0	0	-2	-2	-1	-1	0	0	-90	-45	-100	-100
175	AB	-2	-4*	2	2	2*	0	1	-2	-2	-2	-1	0	0	-90	-45	-100	-100
176		-2	0	-1	0	0	-1	0	-6	-2	-1	0	0	2	-90	-50	-60	-100
177		-2	0	-1	0	0	-1	0	-6	0	-2	-1	0	2	-90	-50	-50	-100
178		-2	0	-1	0	0	-1	0	-6	0	-1	0	0	0	-90	-50	-70	-100
179		-2	0	-1	0	0	-1	0	-2	-2	-2	-1	0	0	-50	-70	-40	-100
180		-2	0	-1	0	0	-1	1	-6	-2	-2	0	0	2	-90	-50	-60	-100
181		-2	0	-1	0	0	-1	1	-6	-2	-1	-1	0	2	-90	-50	-60	-100
182		-2	0	-1	0	0	-1	1	-6	0	-2	0	0	0	-90	-50	-70	-100
183		-2	0	-1	0	0	-1	1	-6	0	-1	-1	0	0	-90	-50	-70	-100
184		-2	0	-1	0	0	0	0	-6	-2	-2	0	0	2	-85	-60	-60	-100
185		-2	0	-1	0	0	0	0	-6	-2	-1	-1	0	2	-85	-60	-60	-100
186		-2	0	-1	0	0	0	0	-6	0	-2	0	0	0	-85	-60	-70	-100
187		-2	0	-1	0	0	0	0	-6	0	-1	-1	0	0	-85	-60	-70	-100
188		-2	0	-1	0	0	0	1	-6	-2	-2	-1	0	2	-85	-60	-60	-100
189		-2	0	-1	0	0	0	1	-6	-2	-1	0	0	0	-85	-60	-80	-100
190		-2	0	-1	0	0	0	1	-6	0	-2	-1	0	0	-85	-60	-70	-100
191		-2	0	-1	2	0	-1	0	-6	-2	-2	-1	0	2	-80	-50	-60	-100
192		-2	0	-1	2	0	-1	0	-6	-2	-1	0	0	0	-80	-50	-80	-100
193		-2	0	-1	2	0	-1	0	-6	0	-2	-1	0	0	-80	-50	-70	-100
194		-2	0	-1	2	0	-1	1	-6	-2	-2	0	0	0	-80	-50	-80	-100
195		-2	0	-1	2	0	-1	1	-6	-2	-1	-1	0	0	-80	-50	-80	-100
196		-2	0	-1	2	0	0	0	-6	-2	-2	0	0	0	-75	-60	-80	-100
197		-2	0	-1	2	0	0	0	-6	-2	-1	-1	0	0	-75	-60	-80	-100
198		-2	0	-1	2	0	0	1	-6	-2	-2	-1	0	0	-75	-60	-80	-100
199		-2	0	2	0	0	-1	0	-6	-2	-2	0	0	0	-75	-50	-80	-100
200		-2	0	2	0	0	-1	0	-6	-2	-1	-1	0	0	-75	-50	-80	-100
201		-2	0	2	0	0	-1	1	-6	-2	-2	-1	0	0	-75	-50	-80	-100
202		-2	0	2	0	0	0	0	-6	-2	-2	-1	0	0	-70	-60	-80	-100
203		2	-4	-1	0	0	-1	0	-6	-2	-2	-1	2	2	-80	-70	-40	-100
204		2	-4	-1	0	0	-1	0	-6	-2	-1	0	2	2	-90	-70	-60	-100
205		2	-4	-1	0	0	-1	0	-6	-2	-1	0	2	0	-80	-70	-60	-100
206		2	-4	-1	0	0	-1	0	-6	0	-2	-1	0	2	-90	-70	-50	-100
207		2	-4	-1	0	0	-1	0	-6	0	-2	-1	2	0	-80	-70	-50	-100
208		2	-4	-1	0	0	-1	0	-6	0	-1	0	0	0	-90	-70	-70	-100
209		2	-4	-1	0	0	-1	0	-2	-2	-2	-1	0	0	-50	-90	-40	-100

EXAMPLE 2

NEW COMBINATIONS USING A VALUE OF 1 FOR LIVING UNIT BEDROOM(DRS/OPENNGS)

SOL#--CASES	CONST P#01	HAZAR AREAS P#02	MANU. ALARM P#03	SMOKE DETEC P#04	AUTOM SPRIN P#05	FINSH UNITS P#06	EGRSS UNITS P#08	SEPAR UNITS P#09	EXIT QUALT P#10	EXIT ACCSS P#11	FINSH EGRSS P#12	VERT OPEN P#13	SMOKE CNTRL P#14	FIRE CNTRL	EGRSS PROV	REFUG PROV	GENRL SAF.
210	2	-4	-1	0	0	-1	1	-6	-2	-2	0	0	2	-90	-70	-60	-100
211	2	-4	-1	0	0	-1	1	-6	-2	-2	0	2	0	-80	-70	-60	-100
212	2	-4	-1	0	0	-1	1	-6	-2	-1	-1	0	2	-90	-70	-60	-100
213	2	-4	-1	0	0	-1	1	-6	-2	-1	-1	2	0	-80	-70	-60	-100
214	2	-4	-1	0	0	-1	1	-6	0	-2	0	0	0	-90	-70	-70	-100
215	2	-4	-1	0	0	-1	1	-6	0	-1	-1	0	0	-90	-70	-70	-100
216	2	-4	-1	0	0	0	0	-6	-2	-2	0	0	2	-85	-80	-60	-100
217	2	-4	-1	0	0	0	0	-6	-2	-2	0	2	0	-75	-80	-60	-100
218	2	-4	-1	0	0	0	0	-6	-2	-1	-1	0	2	-85	-80	-60	-100
219	2	-4	-1	0	0	0	0	-6	-2	-1	-1	2	0	-75	-80	-60	-100
220	2	-4	-1	0	0	0	0	-6	0	-2	0	0	0	-85	-80	-70	-100
221	2	-4	-1	0	0	0	0	-6	0	-1	-1	0	0	-85	-80	-70	-100
222	2	-4	-1	0	0	0	1	-6	-2	-2	-1	0	2	-85	-80	-60	-100
223	2	-4	-1	0	0	0	1	-6	-2	-2	-1	2	0	-75	-80	-60	-100
224	2	-4	-1	0	0	0	1	-6	-2	-1	0	0	0	-85	-80	-80	-100
225	2	-4	-1	0	0	0	1	-6	0	-2	-1	0	0	-85	-80	-70	-100
226	2	-4	-1	0	2	-1	0	-6	-2	-2	-1	0	2	-70	-80	-50	-100
227	2	-4	-1	0	2	-1	0	-6	-2	-2	-1	2	0	-60	-80	-50	-100
228	2	-4	-1	0	2	-1	0	-6	-2	-1	0	0	0	-70	-80	-70	-100
229	2	-4	-1	0	2	-1	0	-6	0	-2	-1	0	0	-70	-80	-60	-100
230	2	-4	-1	0	2	-1	1	-6	-2	-2	0	0	0	-70	-80	-70	-100
231	2	-4	-1	0	2	-1	1	-6	-2	-1	-1	0	0	-70	-80	-70	-100
232	2	-4	-1	0	2	0	0	-6	-2	-2	0	0	0	-65	-90	-70	-100
233	2	-4	-1	0	2	0	0	-6	-2	-1	-1	0	0	-65	-90	-70	-100
234	2	-4	-1	0	2	0	1	-6	-2	-2	-1	0	0	-65	-90	-70	-100
235	2	-4	-1	2	0	-1	0	-6	-2	-2	-1	0	2	-80	-70	-60	-100
236	2	-4	-1	2	0	-1	0	-6	-2	-2	-1	2	0	-70	-70	-60	-100
237	2	-4	-1	2	0	-1	0	-6	-2	-1	0	0	0	-80	-70	-80	-100
238	2	-4	-1	2	0	-1	0	-6	0	-2	-1	0	0	-80	-70	-70	-100
239	2	-4	-1	2	0	-1	1	-6	-2	-2	0	0	0	-80	-70	-80	-100
240	2	-4	-1	2	0	-1	1	-6	-2	-1	-1	0	0	-80	-70	-80	-100
241	2	-4	-1	2	0	0	0	-6	-2	-2	0	0	0	-75	-80	-80	-100
242	2	-4	-1	2	0	0	0	-6	-2	-1	-1	0	0	-75	-80	-80	-100
243	2	-4	-1	2	0	0	1	-6	-2	-2	-1	0	0	-75	-80	-80	-100
244	2	-4	-1	2	2	-1	0	-6	-2	-2	-1	0	0	-60	-80	-70	-100
245	2	-4	2	0	0	-1	0	-6	-2	-2	0	0	0	-75	-70	-80	-100
246	2	-4	2	0	0	-1	0	-6	-2	-1	-1	0	0	-75	-70	-80	-100
247	2	-4	2	0	0	-1	1	-6	-2	-2	-1	0	0	-75	-70	-80	-100
248	2	-4	2	0	0	0	0	-6	-2	-2	-1	0	0	-70	-80	-80	-100
249	2	0	-1	0	0	-1	0	-6	-2	-2	-1	0	0	-50	-90	-40	-100

89 COMBINATIONS HAVE BEEN FOUND

APPENDIX D
Instructional Manual

This manual is provided to assist in completing the Fire Safety Evaluation Worksheets for multifamily residences. The step-by-step instructions for the mechanisms of completing the worksheet are included in the worksheet itself. They are not repeated in this manual. This manual provides expanded discussion and definitions for the various items in the worksheet to assist the user when questions of definition or interpretation arise. To the maximum extent possible, the manual does not repeat the definitions already existing in the Minimum Property Standards (MPS) but rather references the appropriate MPS section. This manual is organized to progressively follow the format of the worksheet.

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Area of Application

The entire apartment building is evaluated on a single worksheet with the following options:

a. Spaces that are not used for living units, in direct utility or maintenance support of the living units, provided for tenant use, or in any way involved in tenant emergency egress may be omitted from the calculation when such space is separated from all of the tenant and tenant support spaces by two hour fire resistive construction (including any members that bear the load of tenant use space and with fire doors conforming to the requirements of section 405-6.5 in any communicating opening). In such case, however, any appropriate charges under Item 2, Hazardous Areas in Table 1 shall be charged.

b. Where an apartment building is divided into two or more elements by firewall(s) meeting the relevant requirements of sections 405-4 (Fire Resistance Requirements), 405-6.5 (Door Opening Ratings), and 405-7.1 (Firewalls, and Lot-Line Walls) the facility may be rated as separate buildings or as a single building whichever gives the better (higher) rating.

Maintenance

Any protection system, requirements, arrangements, or procedures which are not maintained in a dependable operating condition, are used in such a manner that the intended fire safety function or hazard constraint is impaired or are not in a sufficient state of readiness should be considered as defective and receive no credit in the evaluation.

Safety Parameter Table (General Discussion)

The safety parameters are a measure of those building factors that bear upon or contribute to the safety of those persons who may be in the building at the time of a fire.

Each of the safety parameters is to be analyzed, and the safety value for each parameter that best describes the condition in the building is to be identified. Only one value for each of the parameters is to be chosen. If two or more appear to apply, the one with the lowest point value governs.

1. Construction

Construction types are defined by the fire resistance and combustibility of load-bearing framing members, floor construction, and roof construction. In general, the requirements match those for the same members in section 405-4 and Table 4-5.1 of the MPS. Several additional categories however, have been added to provide a means of evaluating the impact of construction systems that include

members or assemblies less fire resistant than the minimum listed for any of the types of construction shown in Table 4-5.1 (i.e. Unprotected structural systems). These have been designated types 2-U, 3-U, and 4-U. Figure 1 provides the appropriate data for classification of construction type in a tabular form similar to Table 4-5.1 of MPS. Figure 1, however, covers only the items necessary for classification of construction types recognized in the evaluation system.

The requirements for the elements in Table 4-5.1 that are not included under construction types are included under a variety of other parameters.

Where the building includes additions or connected structures of different construction, the rating and classification of the building is to be based on (a) separate buildings if a two hour or greater fire resistive separation exists between the portions of the building and on (b) the lower safety parameter's point score involved if such separation does not exist.

The story used to determine the parameter value is the highest story used for sleeping purposes. Story height is based on stories starting with the grade floor or the lowest floor used for sleeping purposes, whichever indicates the greater number of floors.

Any building involving conditions that fail to meet the requirements of section 405-7.2b for firestopping of concealed floor and roof spaces of combustible construction is to be classified as an unprotected type of construction (i.e., 4-U, 3-U, or 2-U as otherwise appropriate).

2. Hazard Areas

The assignment of charges for hazardous areas is a four-step process.

Step 1. Identify Hazardous Areas. A hazardous area is any space or compartment that contains a storage or other activity that is not a part of normal household living space arrangements and possesses the potential of producing a fully involved fire. A list of typical hazardous areas is listed under the heading, Exposure, in Figure 2.

Step 2. Determine the Level of Hazard. There are two levels of hazard as follows:

a. Structurally Endangering. A hazardous occupancy with sufficient fire or explosion potential to defeat the basic integrity of all exposed elements of the building framing as defined in Parameter No. 1.

b. Not Structurally Endangering. A hazardous occupancy with sufficient fire potential to build to full involvement and presents a danger of propagating through openings or wall

partitions but not possessing sufficient total potential to endanger any exposed elements of the structural framing or floor decking as defined in Parameter No. 1.

NOTE: Where a hazardous area is exterior to the building (an exterior exposure) the fire resistance of the exposed portions of the building shall govern the classification as shown in Figure 2. Where an in-building hazardous area is enclosed within a portion of the building having fire resistance above that credited for the building in Parameter No. 1, the minimum fire resistance of bearing walls, bearing partitions, columns, beams, girders, trusses, and floor-ceiling assemblies exposed to the hazardous area shall be used in determining whether or not the area is structurally endangering.

Where the vertical separation of exterior openings does not meet the requirements of Section 405-10.2, the facility shall be charged as having "Not Structurally Endangering" hazardous areas "Outside Living Units".

Figure 2 provides an analysis of typical types of hazardous areas relative to inherent potential structural danger to different classes of structural systems.

Step 3. Determine the Fire Protection Provided. The parameter value for hazardous areas is based on the presence or absence of the fire protection necessary to control or confine the hazard. Two different types of fire protection are considered. Th first consists of automatic sprinklers or other appropriate extinguishing system covering the entire hazard.* The second is a complete fire resistive enclosure including any bearing members in the space, partitions separating the hazardous area from all other spaces, and doors to the space sufficient to exceed the potential of the fire load involved. Any hazardous space that has either protection system is classified as having single protection. Any hazardous space that is both fully enclosed in a capable fire resistive enclosure and sprinklered is classified as having both (i.e. double level protection). On this basis, any fuel load that has the potential of overwhelming the available structural capability could as a maximum have single protection.

* When the hazardous area is within a living unit or abuts an egress route (exit access or exit) addressed in Parameters 10, 11, or 12, the credit for sprinklers is not to be given unless the hazardous area is separated from the rest of the living unit or the egress route by reasonably smoke resisting partitions and doors.

Step 4. Determine Degree of Deficiency and Assign Parameter Values. The parameter value is finally determined on the basis of the degree of deficiencies that the hazardous area has in terms of the level of protection needed.

Figure 3 provides a matrix type table to assist in determining degree of deficiency to be assessed.

In some situations, more than one hazardous area with the same or differing levels of deficiency will exist. The charge is based on the single most serious charge for hazardous area found.

3. Manual Fire Alarm

Manual fire alarm systems shall conform to the applicable requirements of NFPA 72A. The manual alarm system categories are as follows:

a. None. There is no manual fire alarm system, or the system is incomplete and does not meet the requirements necessary for a higher scored category.

b. W/O F.D. Notif. There is a manual fire alarm system with at least one manual fire alarm box per floor located in each credited path of egress and at least one sounding device per floor which is clearly audible in the sleeping areas of each apartment. Operation of any manual box shall cause the operation of all sounding devices. Buildings may have a zoned, non-coded alarm system which sounds the initial alarm only on the fire floor, and the floors directly above and below the fire floor with provision at a central monitoring point to activate a general fire alarm.

c. W/ F.D. Notif. There is a manual fire alarm system which complies with the requirements of b above and, in addition, automatically transmits a signal to the fire department which is legally committed to serve the area in which the building is located, through a direct connection, an approved central station, or through other means acceptable to the authority having jurisdiction. No credit is given for F.D. Notif. in buildings higher than six stories if an annuciator which indicates the location of the fire by floor is not provided.

4. Smoke Detection and Alarm

A detection system as used herein is one based on the use of smoke detectors. No recognition is given for thermal detectors. The detection system categories are as follows:

a. None. There are no smoke detectors in the building or if any are present they do not meet the requirements necessary for a higher scored category.

b. Single Station Detectors. Single station detectors are those detectors that sound the alarm only at the detector itself. The operation of single station units does not involve the transmission of the alarm beyond the sounding of the alarm device in the unit itself.

(1) Single Level (Sin. Lev.). This value applies only where the facility includes one or more multi-level living units that do not have one or more single station detectors on each level of the living unit but at least has one detector in the immediate vicinity of each separate sleeping area.

(2) Every Level (Ev. Lev.). This parameter applies to those situations where there is one detector in each single level living unit and one detector on each level of any multi-level living units.

c. Interconnected Systems. Interconnected systems are those systems so arranged that the operation of any detector within the living unit sounds alarm devices on other detectors or other separate alarm systems sufficient to alert all of the occupants. Where the systems are of the total building variety, or where the parameter value for Parameter 9, Separation of Living Units is a negative value, the credit can be given only if the building has a manual fire alarm system and the operation of the detection system sounds the manual fire alarm as though a fire alarm box on that floor had been operated. Interconnected systems for living units must provide sounding devices that are sufficient in location and loudness to assure the awakening of normally sleeping persons.

(1) Every Level (Ev. Lev.). This parameter applies to those situations where there is one detector in each single level living unit and one detector on each level of any multi-level living units.

(2) Plus Every Bedroom (+ Ev. Bedroom). To be credited for every bedroom a single level living unit must have a smoke detector in every bedroom and at least one additional detector in the common living space not involved in the bedroom. In a multi-level living unit there must also be at least one detector on each level in addition to the preceding requirement.

(3) Total Building Systems. This system includes detector locations meeting the every bedroom standard throughout each living unit and also provides detector coverage throughout all corridors, common spaces, and hazardous areas with the system either incorporated within the manual fire alarm system or meeting the requirements for an automatic fire alarm system in accords with NFPA Standard No. 72.

5. Automatic Sprinklers

a. None. No credit is given if there are no sprinklers or if sprinklers, though present are not sufficient to qualify for one of the other categories listed herein.

Note: Any space that is to be credited as being protected by automatic sprinklers that abuts a hazardous area that is deficient in accordance with Parameter 2, Hazardous Areas, will not be considered as sprinkler protected unless that hazardous area is also sprinkler protected.

b. Corridors and Public Spaces. Sprinkler protection covers all of the corridors and public spaces that separate, directly expose, or are in the egress path from the living units (except fire resistive enclosed non-combustible stairwells).

c. Living Units Only. All living units have sprinkler protection complying with the requirements for light hazard protection in NFPA Standard No. 13.

d. Corridors and Public Habitable Spaces. Meets the combined requirements for b and c, above.

e. Total Building. The building is totally sprinkler protected in accordance with NFPA Standard No. 13 for light hazard occupancy (or higher hazard occupancy for any spaces classified as higher hazard by NFPA Standard No. 13) and is equipped with an automatic alarm initiating device that will activate the the building manual fire alarm system as credited in Item 3, Manual Fire Alarm.

6. Interior Finish (Within Living Units)

The interior finish within the living units is evaluated separately from the interior finish in the corridor and egress routes and other public space. The types of surfaces covered, exemptions and flame spread tests, are as defined in Section 405-8.

No consideration is given for any interior finish with a flame spread rating >200 or for any material not rationally measured by the ASTM E84 Test. Materials not rationally measured include: foam plastics, asphalt impregnated paper and/or materials capable of inducing extreme rates of fire growth and rapid flashover. In any case where these materials are involved the resultant risk is considered beyond the capacity of this evaluation system and will require individual appraisal.

In assessing the charge for interior finish, use the most combustible interior finish as defined by Section 405-8.

NOTE: 1/4 inch plywood can be considered as having a flame spread of 200 or less.

7. Living Unit Bedroom Doors

a. No Door. The charge for no door shall be assessed if any bedroom or other room used for sleeping purposes does not have a door; has a door but there is some mechanism or obstruction which prevents closing of the door or otherwise leaves a significant opening between the door and the corridor; the door has open louvers; or has ordinary glass lights or transoms.* Doors that have been blocked open by doorstops, chocks, tiebacks, or other devices that require manual unlatching or releasing action to close the door shall be classified as "No Door". Also doors that are not provided with a latch or other device suitable for keeping the door tightly closed shall be classified as "No Door".

* Ordinary glass lights shall not be considered as requiring the "No Door" classification in locations where both sides of the glass light are protected by automatic sprinklers.

b. Doors With Less Than 20 Minute Fire Resistance (<20 Min.). Doors which are not deficient as described in a, but do not meet the requirements for c, below, will be classified as less than 20 minute fire resistance.

c. 20 Minute or More Fire Resistance. Doors shall be considered as having 20 minute or greater fire resistance if they are 1-3/4 inch solid core wood construction or any other arrangement of equal or greater stability in fire integrity. The thermal insulation capability of the door is not considered. Hollow or sheet steel doors therefore shall be considered to meet the 20 minute requirement.

8. Egress From Living Units

a. Single Route. The single route charge is assessed in any location where there is only one emergency exit route from either a single or multi-level unit with no alternatives meeting any of the requirements in the following subparagraphs. A living unit with two doors may still be charged with a single route if the two doors are in such proximity to each other in terms of the living unit that they do not provide alternative routes.

b. One Door Plus Escape Windows. This value is credited when the unit has a door providing a means of unobstructed travel out of the living unit and there are outside windows operable from the inside without the use of tools that provide a clear opening of not less than 20 inches in width, 24 inches in height and 5.7 sq. ft. in area. The bottom of the window shall not be more than 44 inches above the floor.

c. Remote Exits. Remote exits exist when there are two exit doorways from the living unit leading to direct or stairway access to the street so located that occupants of any bedrooms or sleeping areas have an option for two alternative directions of egress immediately upon leaving the bedrooms or sleeping area.

d. Greater Than 50 Foot Travel (>50 Ft. Travel). The charge for >50 ft. travel is to be assessed if any living units assessed as either "Single Route" (a, above) or "One Door Plus Escape Windows" (b, above) if the distance within a living unit between the door to the most remote room on a doorway to an exit or exit corridor exceeds 50 feet.

9. Separation of Living Units from Each Other and from Common Spaces

Separation of living units from each other and from common spaces shall be based on the wall partition making the separation and the protection of the openings in those partitions. Ceiling and floor partitioning will not be considered in this category. These elements are covered under Parameter No. 1, Construction.

Duct penetrations where the duct is open on one side only of the partition and is of sheet steel construction shall be considered as equivalent to doors having a fire resistance of at least 20 minutes. Where there are duct openings on both sides of the partition the opening shall be considered unprotected unless there is a fire damper in the duct opening or the duct otherwise meets the requirements for omission of fire dampers as specified in NFPA Standard No. 90A.

The partition shall be considered as "None or Incomplete" if it has unprotected openings (louvers, gaps, transfer grills, plain glass windows, or plain glass transoms) between the floor and the ceiling. If openings exist above the ceiling level (or even if the partition stops at the ceiling level), the walls shall be considered as complete if the ceiling itself is a complete membrane (such as plasterboard or lathe and plaster). In which case, the fire resistance rating shall be based on that of the wall or ceiling system whichever is less.

Walls shall be considered to have less than 20 minute ratings (Walls <20 Min) if they are not equivalent to 1/2 inch gypsum wallboard on both sides of studs well nailed or fastened to the studs with appropriate taping and finishing of joints and fasteners. Walls shall be considered as equal to or greater than 1 hour (Walls $\geq$ 1 Hr) if they are of any of the established systems recognized as having 1 hour or greater fire resistance in accordance with recognized tests or approved listings.

Walls are considered to have fire resistance ratings of 1 Hr or greater when they are of a construction demonstrated to have such resistance by ASTM E-119 or equivalent qualifications.

Doors shall be considered as "None or Incomplete" if any living unit does not have a door; has a door but there is some mechanism or obstruction which prevents closing of the door or otherwise leaves a significant opening between the door and the corridor; the door has open louvers; or has ordinary glass lights or transoms.* Doors that have been blocked open by doorstops, chalks, tiebacks, or other devices that require manual unlatching or releasing action to close the door shall be classified as "None or Incomplete". Also doors that are not provided with a latch or other device suitable for keeping the door tightly closed shall be classified as "No Door".

* Ordinary glass lights shall not be considered as requiring the "No Door" classification in locations where both sides of the glass light are protected by automatic sprinklers.

The separation shall be considered as "None or Incomplete" if either the partitions or doors involved are so classed.

Doors shall be considered as having 20 minute or greater fire resistance (Doors $\geq$ Min) if they are a 1-3/4 inch thick solid core wood construction or arrangement of equal or greater stability in fire integrity. The thermal insulation capability of the door is not considered. Hollow or sheet steel doors therefore meet the 20 minute requirement.

Doors are to be considered as having 45 minute or greater fire resistance if they are so listed or labeled by an acceptable testing laboratory or otherwise shown to meet the requirements for such resistance in accordance with NFPA Standard No. 80.

Automatic closing doors (W/A.C.) shall be considered automatic closing if they are provided with devices that either provide the traditional self-closing mechanisms or a smoke detector closing mechanism. In the case of doors separating living units from each other or from common spaces, self-closing doors shall be accepted whether or not they are equipped with devices that can be used to hold them in the open position so long as the normal operating mode of the living unit is to keep the door closed, particularly after the occupants have retired for the night.

NOTE: This parameter does not cover the charges for dead end conditions, travel distance, interior finish in the exits or exit access routes, or enclosure of stairways or other exit routes that pass from floor to floor. These elements are separately covered in Parameters 11, Exit Access; 12, Interior Finish (Egress Routes); and 13, Vertical Openings.

10. Exit System

Exit routes are the paths of travel from the living unit to the outside of any of the types and arrangements described in Sections 402-1 through 402-8 of the Minimum Property Standards.

Where subdivision of concealed floor and roof spaces of combustible construction fails to meet the criteria of 405-7.2b, the evaluation is based on the resultant conditions with the maximum credit based on less than 1 hour walls (<1 Hr).

a. Multiple Routes. Multiple routes exist when the occupants of any living unit have either from the living unit or through access in a corridor adjacent to the living unit a choice of 2 separate exit routes to the outside of the types described in Sections 402-2 through 402-7, 403 or 405-6.

b. Deficient. An exit route is deficient if it fails to meet any of the applicable criteria in Sections 402, or 405-6, of the Minimum Property Standards except for those covered in Parameters 11, 12, and 13. The exit system is also graded as deficient if there is not at least one horizontal exit on each floor of any building that is graded 2U, 3U, or 4U construction or that exceeds the area limitations in Table 4-5.2.

c. Without Horizontal Exits (W/O Horiz.). Egress system is based on this charge if there are multiple routes that are not deficient but the arrangement does not include a horizontal exit as defined below or have acceptable direct exit from each living unit as defined below.

(1) In addition this category shall apply to special cases meeting the following:

(a) A one story building containing a maximum of 8 living units.

(b) A 2 story building containing a maximum of 8 living units and not more than 4 units per floor with one hr. fire resistive enclosed stairway immediately accessible to all living units.

(c) A 3 or 4 story building having not more than 4 living units per floor with a smokeproof tower, or a fire resistive enclosed stairway with a 2 hr. rating for a four-story building and a one hr. rating for a three-story building immediately accessible to all living units.

d. Horizontal Exit (W/ Horiz. Exit). The credit for horizontal exit is to be given if each floor containing living units has at least one horizontal exit meeting all of the following:

(1) The horizontal exit meets the definition of such in Appendix A of the MPS.

(2) Each refuge area formed by a horizontal exit has access to at least one exit from the building without recrossing the line of the horizontal exits.

(3) The space in each refuge area formed by a horizontal exit provides at least 3 sq. feet of accessible space for all of the potential occupants already present in or evacuating to it.

e. Direct Exits. To be credited with direct exits each living unit shall have within that unit a door that opens to the exterior at grade or onto an exterior balcony with direct access to an exterior exit or smoke proof tower. Where such openings are directly onto grade in a location where any person egressing can move directly away from the building without further exposure the credit for direct exit is applicable even if there are no other exit routes from the involved living unit. (The assessment of charges for Parameter 8, Egress from Living Units is not altered by this allowance.)

11. Exit Access

Exit access is a measurement of the travel from the living unit to the outside or to an enclosed interior stairway or other exit (e.g. horizontal exit) or smoke partition as defined in Parameter 14, whichever is shorter.

The charge for dead-end (D.E.) access shall be charged when any corridor affords access in only one direction to a required exit from that corridor. The calculation of the distance to determine the level of charge is the measurement from the centerline of the doorway exiting the most remote living unit to the point offering two or more directions of exit. Exit travel is the distance from the door of the living unit to the point where the building is exited or a stairwell is entered whichever is less. Where the distance to the stairwell is shorter that distance shall be based on the distance to the door enclosing the stairwell if the stairwell is enclosed or to the top tread if the stairwell is open.

12. Interior Finish (Corridors and Egress Routes)

The interior finish within the living units is evaluated separately from the interior finish in the corridor and egress routes and other public space. The types of surfaces covered, exemptions and flame spread tests, are as defined in section 405-8.

No consideration is given for any interior finish with a flame spread rating >200 or for any material not rationally measured by the ASTM E84 Test. Materials not rationally measured include: foam plastics, asphalt impregnated paper and/or materials capable of inducing extreme rates of fire growth and rapid flashover. In any case where these materials are involved the resultant risk is considered beyond the capacity of this evaluation system and will require individual appraisal.

In assessing the charge for interior finish, use the most combustible interior finish as defined in Section 405-8.

NOTE: 1/4 inch plywood can be considered as having a flame spread of 200 or less.

The corridors and egress route, for purposes of this parameter, is the complete system-corridors, stairs, lobbies and any other spaces open to the primary or alternate routes of exit from every living unit to the exterior. A space shall be considered open to the exit route if it is not a living unit and is not separated by interior partitions with self-closing door having fire resisting capabilities equal to that credited by item 9, or item 13, whichever is greater.

13. Vertical Openings

These values apply to vertical openings and penetrations including exit stairways, ramps and any other vertical exits, pipeshafts ventilation shafts, duct penetrations and laundry and incinerator chutes. The charge for vertical openings shall be based on the presence or lack of enclosure and the fire resistance of enclosure if present.

A vertical opening or penetration shall be classified as open (or Incomplete Enclosure) if it is: (a) unenclosed; (b) is enclosed but does not have doors; (c) is enclosed but has openings other than doorways; (d) is enclosed with cloth, paper or similar materials without any sustained fire stopping capabilities.

If a shaft other than in a credited exit route (i.e. credited as one of the multiple routes required in Parameter 10 or in determining travel distance in Parameter 11) is enclosed on all floors but one and this results in an unprotected opening between that shaft, and one and only one floor, the parameter value assigned to that shaft shall be 0. If a required egress route is contained in that shaft the parameter value shall be -2.

If firestopping fails to conform with the requirements of 405-7.2a, the vertical opening so created shall be evaluated using the above criteria.

14. Smoke Control

Smoke control definitions are as follows:

a. No Control. There are no smoke barriers (or horizontal exits) on the floor, the floor is not served by a smoke proof stair-tower, and there are no mechanically assisted smoke control systems serving the floor.

b. Smoke Partitions. Smoke partitions consist of one-hour fire rated partitions extending across the entire width of the building or so arranged as to combine a partition in the corridor with existing building elements and subdividing partitions and walls to effectively completely partition the building into two separate units. The smoke partition must be equipped with 3/4-hour fire doors in the corridor that are closed upon detection by smoke detectors located at the door arches or by smoke detector systems that have been credited as the 6 point value in Parameter 4, Smoke Detection and Alarm. Each smoke compartment must also be serviced by an elevator as described in Section 405-9. Horizontal exits will act as a smoke partition and when it exists it is credited as both a smoke partition in Item 14 and a horizontal exit in Item 10.

c. Mechanically Assisted Systems - By Zone. Mechanically assisted smoke control on a zone basis must include a smoke partition (or a horizontal exit) supported by a mechanism of automatic control fans, smoke vent shafts, or a combination thereof to provide a pressure differential that will assist in confining smoke to the compartment of origin. Fans involved may be special smoke control fans or special adjustments of the normal building air movement fans.

d. Mechanically Assisted Systems - By Unit. Mechanically assisted smoke control on a living unit basis are systems so designed as to provide a mechanism of automatically controlled fans, smoke vent shafts, or combination thereof to insure a positive pressure differential that will prevent intrusion of smoke into any living unit not involved in fire. On this basis, the living unit will have a pressure differential higher than the corridor and higher than any living unit where fire has been detected. Such systems must be so arranged that there is detection in each living unit that will prevent a living unit that is involved in fire from becoming positively pressurized.

e. Mechanically Assisted Systems - Corridors. Mechanically assisted smoke control on a corridor basis is a system initiated by a method of smoke detection that will assure operation of the smoke control system before significant smoke has entered into the corridor involved. The mechanism must be capable of pressurizing the corridor sufficiently to prevent smoke from the living unit or space of origin from entering the corridor through the entire course of fire. Such a system must be able to hold back the smoke through the expected maximum severity of the fire. It must also be capable of evacuating smoke from the corridor on the presumption that the emergency evacuation procedures and other activities involving the opening and closing of doors will cause occasional brief periods of overpowering the smoke control system and movement of the smoke into the fire area of the corridor. (This would normally be accomplished by having an exhaust fan from the corridor of lower capacity than the fan supplying air for pressurization. The net pressurization force would occur from the effect of the pressurizing fan minus the effect of the removal or purging fan.) To be effective the corridor's pressurizer system would normally necessitate early warning smoke detection, automatic closing of all living unit doors, and/or sprinklered protection. Where these additional protection devices are provided in order to effect such a smoke control system the individual credits for each of the involved protection devices are in addition to the credits for the smoke control system.

f. Smoke Proof Towers. Credit for smoke proof towers may be given if either the stairways meet the requirements for a smoke proof tower specified in Section 5-2.3 of the Life Safety Code (NFPA 101-1976) or has an acceptably designed smoke pressurization system maintaining a positive pressure in the stairwell sufficient to prevent intolerable contamination of the stairwell by smoke or other fire effects.

CONSTRUCTION TYPES

MINIMUM FIRE RESISTANCE RATINGS IN HOURS NEEDED TO QUALIFY FOR INDICATED TYPE OF CONSTRUCTION

	COMBUSTIBLE						NONCOMBUSTIBLE			
ELEMENTS OF CONSTRUCTION	TYPE 4-U	TYPE 4	TYPE 3-U	TYPE 3b	TYPE 3bH.T.	TYPE 3a	TYPE 2-U	TYPE 2b	TYPE 2a	TYPE 1
EXTERIOR WALLS										
Bearing	C	1	NC	1-NC	1-NC	2-NC	NC	1-NC	2-NC	3-NC
Non-bearing	C	C	NC	NC	NC	NC	NC	NC	NC	NC
INTERIOR WALLS & PARTITIONS										
Bearing	C	1	C	1	1	2	NC	1-NC	1-NC	3-NC
Non-bearing	C	C	C	C	C	C	NC(B)	NC(B)	NC(B)	NC(B)
COLUMNS,BEAMS GIRDERS,TRUSSES	C	1	C	1	H.T.	2	NC	1-NC	2-NC	3-NC(A)
FLOOR/CEILING ASSEMBLIES	C	1	C	1	H.T.	1	NC	1-NC	1-NC	2-NC
ROOF/CEILING ASSEMBLIES	C	3/4(D)	C	1(D)	H.T.(D)	1(D)	NC	3/4-NC(B)	1-NC(B)	11/2-NC(D)

NOTES: C = Wood or other approved combustible members accepted, no specific fire resistance required.
NC = Member/assembly to be of noncombustible materials, no specific fire resistance required.
-NC = Member/assembly to be of noncombustible materials and have indicated fire resistance.
H.T. = Heavy timber, component to meet size requirements of note (6) to Table 4-5.1 of MPS.
(A) = 2-Hour if supporting only one floor (deck) or roof.
(B) = Fire-retardant treated wood acceptable for non-bearing vertical construction in internal walls and partitions and for roof assemblies including purlins and decking for indicated construction types where access to roof is not provided.
(D) = Or a ceiling assembly having a 25 min. finish rating and a ventilating attic.
(U) = Unprotected construction (one or more elements are less fire resistive than the minimum level specified by section 405-4 of the MPS)

FIGURE D-1 - CONSTRUCTION CLASSIFICATION

INHERENT STRUCTURAL DANGER FROM TYPICAL HAZARDOUS AREAS

EXPOSURE (Area, Space, Activity, Condition)	MINIMUM FIRE RESISTANCE OF BEARING WALLS, BEARING PARTITIONS, COLUMNS, BEAMS, GIRDERS TRUSSES, AND FLOOR/CEILING ASSEMBLIES EXPOSED TO HAZARDOUS AREA N/SE = Not Structurally Endangering; SE = structurally Endangering		
	≥2-Hour	≤2-Hour; ≥1-Hour	≤1-Hour
Exterior Exposure <10'	N/SE	SE	SE
<30'		N/SE	
Commercial Space	N/SE	SE	SE
Service Spaces	N/SE	SE	SE
Tenant General Storage Area	N/SE	N/SE	SE
Resident Garage ≤4 cars	N/SE	N/SE	SE
Resident Garage >4 cars	N/SE	SE	SE
Boiler, Heater, or Incinerator Rooms, Fuel Storage	N/SE	SE	SE
Trash Chutes	N/SE	SE	SE
Trash Rooms	N/SE	SE	SE
Small Trash Collection Room	N/SE	N/SE	SE
Abutting Exterior Exposure	N/SE	SE	SE
Laundries	N/SE	N/SE	SE
Repair Shops	N/SE	VARIES	SE

FIGURE D-2 - HAZARDOUS AREA - LEVEL OF HAZARD

	NO PROTECTION	SPRINKLER PROTECTION	FIRE RESISTIVE ENCLOSURE	SPRINKLERED FIRE RESISTIVE ENCLOSURE
NOT STRUCTURALLY ENDANGERING	SINGLE DEFICIENCY	NO DEFICIENCIES		
STRUCTURALLY ENDANGERING	DOUBLE DEFICIENCY	SINGLE DEFICIENCY	NO DEFICIENCIES[A] DOUBLE DEFICIENCY[B]	NO DEFICIENCIES[A] SINGLE DEFICIENCY[B]

A. If fire resistance & structural strength exceed maximum potential of hazard.

B. If fire resistance or structural strength is not sufficient to withstand potential of hazard.

FIGURE D-3 - HAZARDOUS AREA - DEGREE OF DEFICIENCY

NBS-114A (REV. 2-8C)

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☐ Document describes a computer program; SF-185, FIPS Software Summary, is attached.

11. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here)

A qualitative evaluation system for grading multifamily housing in terms of fire safety has been developed and is ready for testing in Department of Housing and Urban Development field offices. The system is designed to be used to identify a variety of combinations of widely accepted fire safety equipment and building construction features that provide a level of safety equal or greater than that achieved by conformance to the explicit requirements of the HUD Minimum Property Standards. In this evaluation, equivalent safety performance is gauged in terms of overall level of safety provided rather than a component by component comparison.

12. KEY WORDS (Six to twelve entries; alphabetical order; capitalize only proper names; and separate key words by semicolons)

Building codes; building construction; Delphi Method; fire safety; interior finishes; Life Safety Code; Minimum Property Standards; multifamily housing; risk analysis; safety equivalency; safety evaluation; smoke detection; sprinkler systems.

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